NATIONAL ENVIRONMENTAL MONITORING

HEARINGS

BEFORE THE

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OF THE

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NATIONAL ENVIRONMENTAL MONITORING

THURSDAY, MAY 19, 1983

House of Representatives,
Committee on Science and Technology,
Subcommittee on Natural Resources,
Agriculture Research and Environment,
Washington, D.C.

The subcommittee met, pursuant to call, at 2 p.m., in room 2318, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Mr. Scheuer. The Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

Today is the first of 3 days of hearings on national environmental monitoring.

We have been joined by Congressman Tim Valentine and we will be shortly joined by Congresswoman Claudine Schneider, both of them very active, very contributing members of this subcommittee. We are delighted that they are here today.

We are holding these hearings because of our concern about the condition of the Nation's environmental monitoring programs, programs which are essential both for enforcing existing environmental statutes and for detecting future environmental problems, and hopefully nipping them in the bud.

In 1977 the predecessor to this subcommittee, chaired by my distinguished colleague from California, Mr. George Brown, held hearings on this important topic. At those hearings the inadequacy of environmental monitoring was underscored by several witnesses. A National Academy of Sciences report in 1977 concluded that the Nation's information on environmental quality was deplorably and unnecessarily poor.

Since that time, the Congress has received much additional information pointing to grave deficiencies in monitoring. A 1980 report from the Council on Environmental Quality; reports in 1981 and 1982 from the General Accounting Office, the investigatory arm of the Congress; a 1982 report from the Conservation Foundation, which was devastating in its criticism; and a 1983 report from the Office of Technology Assessment.

The Conservation Foundation's report on "State of the Environment—1982" goes so far as to say that we have no monitoring data sufficient to describe accurately the extent or the developing seriousness of any environmental problem. Now, that is truly a shocking statement for a responsible organization to be able to make without contradiction.

In February of this year, symptomatically and symbolically, the Chemical Manufacturers Association joined the Environmental Defense Fund in a suit against the Environmental Protection Agency and the Department of Health and Human Services. The suit is aimed at accelerating the Government's program for collecting data on the impact on public health from hazardous waste sites, and indeed from all of the smokestack industries that produce acid rain, that contribute to the greenhouse effect, and other environmental problems. This unusual alliance, to say the least, shows that we all benefit from good environmental monitoring, and that we are threatened and hurt either by poor monitoring or, in many cases, no environmental monitoring at all.

During these hearings we will take a hard look at monitoring in connection with air, water, and ground water pollution, and pollution in the marine environment. We will hear testimony from representatives of the Federal Government, State, and regional agencies, from industry, from academia, environmental groups, and private consultants. Our objectives are to identify problems and to make recommendations that will lead to improvements in environmental monitoring.

Today we will hear from witnesses who will not only give us a historical perspective on the problems that we face in monitoring the environment, but also provide us with suggestions on how to improve our monitoring systems.

In addition, we will hear from representatives of the Environmental Protection Agency and the U.S. Geological Survey, the two Federal entities primarily responsible for air and water quality monitoring. So before we ask our witnesses to join us at the witness table, I would like to turn to the distinguished minority member of our subcommittee, Congresswoman Claudine Schneider, for any comments she may wish to make.

Mrs. SCHNEIDER. I will keep my comments very brief, Mr. Chairman, because we have a large number of witnesses and I look forward to hearing their expertise and their comments. But I would like to commend you for pulling together this particular hearing because I think you know I share the emphasis that needs to be placed on monitoring. I am a long-time believer in preventive medicine and I think that preventive measures, such as monitoring, play an important role in anticipating any crisis or in measuring the cumulative impact of minimal amounts of pollution, and being able to project the long term or long range impact.

Second, there is no question that regulations will continue to be challenged in the courts by both industry and by the consumers alike, until we can guarantee that the regulations that are promulgated can be substantiated with good science, good information, that is collected through the monitoring process.

So, I commend you for holding the hearing, and I look forward to further testimony.

Thank you, Mr. Chairman.

Mr. SCHEUER. Thank you, Congresswoman Schneider.

Congressman Valentine.

Mr. VALENTINE. I have no statement, Mr. Chairman.

Mr. SCHEUER. Then we will ask our witnesses all to come to the table. Mr. Walter Lyon, adjunct professor of the University of

Pennsylvania; Dr. James Reisa, vice president and general manager IDEA *TECH Associates; Dr. Courtney Riordan, Environmental Protection Agency; and Mr. Philip Cohen, U.S. Geological Survey.

What we thought we would do is give each of you 7 or 8 minutes to give your testimony and after the four of you have testified I am sure we will have some questions for you, and you might have some questions for each other. There is no reason why we can't keep this interesting and informal, and see what kind of cerebration we can produce here.

All of your statements will be presented in full at this point in the record, so you may wish to sum up, just chat with us as if you were sitting in your living rooms chewing the fat on the subject of environmental monitoring. So why don't we go from your right to your left.

I understand that Dr. Riordan will be commenting on some of the other testimony, so we will hold you until later and we will start with Mr. Walter Lyon, private consultant and adjunct professor at the University of Pennsylvania. If you will chat with us for about 7 or 8 minutes, and as I say, then when all four witnesses are finished, we will surely have some questions for you.

STATEMENTS OF WALTER A. LYON, PRIVATE CONSULTANT AND ADJUNCT PROFESSOR, UNIVERSITY OF PENNSYLVANIA; JAMES J. REISA, VICE PRESIDENT AND GENERAL MANAGER, IDEA *TECH ASSOCIATES, INC.; COURTNEY RIORDAN, ENVIRONMENTAL PROTECTION AGENCY; AND PHILIP COHEN, U.S. GEOLOGICAL SURVEY, ACCOMPANIED BY RICHARD SMITH, HYDROLOGIST; DAVID RICKERT, HYDROLOGIST; AND JACK PICKERING, CHIEF, BRANCH OF WATER QUALITY

Mr. Lyon. Mr. Chairman, it is indeed a pleasure to appear before you and members of the subcommittee today. The subject of these hearings has been of great personal and professional interest to me for nearly a quarter of a century. I bring to you the point of view of an environmental professional who has spent 35 years attempting to manage environmental problems at all levels of government.

I will briefly summarize my written statement which I have submitted. In this verbal summary of my statement I will focus on four items: Some aspects of the history of environmental monitoring; Federal environmental monitoring programs; the Nation's environmental monitoring programs as opposed to the Federal; and recommendations for improvements.

Perhaps the most dramatic example of the value of environmental monitoring in facilitating a timely and well managed solution to a very serious environmental problem occurred in this country shortly after the turn of the century when it was recognized that typhoid fever was a waterborne illness which could be controlled by chlorination of our drinking water and, most importantly, that one could directly measure the results of the program by a dramatic reduction in typhoid fever mortality, how many Americans were dying from typhoid fever. That program began just after the turn of the century, after a series of devastating epidemics in some of our major cities, including Pittsburgh. But in less than three decades the Nation's health agencies had reduced typhoid fever mortality to nearly present levels—a neat example of how good scientifically valid monitoring information leads to an effective response and results.

Of course, we remember when in the early 1960's Rachel Carson and others warned us that the chemical age and the growth in the volume and variety of chemicals would expose us to serious environmental problems. Since that time at least 10 separate national groups of experts in the field have studied our environmental programs and have deplored, as you just did, the lack of a national environmental monitoring program.

Their unanimity is amazing. They observed that it is not likely that we will be able to manage environmental protection programs effectively without the kind of insight about the entire system, which a national environmental monitoring program would give us, about the pathways of pollutants through the system, and, of course, their effects on man and nature and the success or failure of Government programs.

They recommended essentially four things:

One, environmental monitoring be given a very high priority;

Two, that it should be carried out as a separate and independent effort;

Three, that it be provided with strong scientific leadership; and

Four. That the program measure problems and progress, and in addition, and importantly, attempt to anticipate problems before they occur. As you know, we are frequently surprised by new things like the Love Canal and other things. They talked about the fragmentation and when you read reports about the conditions of the environment, such as the Council on Environmental Quality's 1981 report, it is virtually impossible to trace a single chemical through the environment.

For example, the report says that 60 to 90 percent of the PCB's that are in one of our Great Lakes comes from airborne pollutants, yet when you look to the air quality part of the report it says nothing about the control of PCB's.

I would now like to turn to the Federal monitoring effort. Environmental monitoring by Federal agencies represents only a small share of the total national monitoring effort. Ron Robie, then director of the California Department of Water Resources, in a 1977 letter to this subcommittee pointed out that non-Federal groups, such as State, local, and private entities, invested three to four times as much effort in environmental monitoring as the Federal Government. Federal environmental monitoring efforts are scattered through many programs in many agencies. These efforts are not coordinated within the agencies nor within the Federal Government.

Much of this fragmentation is imposed by the Federal Government upon State and local government and private industry. It thereby diminishes its management value and greatly increases costs. This federally imposed fragmentation makes it virtually impossible to put things together in a logical way at the State and regional level.

In my 1978 testimony, I estimated that there must be, within a 50-mile radius of Philadelphia, at least 100 laboratories which receive Federal funds for some significant amount of environmental work where the same fragmentation pervades federally supported data collection and computer programs. Consolidation would have the dual benefit of more useful data and lower unit costs.

Now I would like to briefly comment on the national program as opposed to the Federal program. I am sure that any analysis of the national total effort in environmental monitoring would show (1) that it is huge, that the resources committed to it are large and significant, and (2) that due to its fragmentation and limited scientific value, it is of virtually no help in understanding and managing the totality of our environmental problems and programs.

In saying this, I do not want to diminish the important work being done by some groups, such as the Ohio River Valley Water Sanitation Commission; the Potomac Commission, IJC, and the USGS water quality assessment studies. They have been a great help and I am sure there are others, but they are all limited to one phase of the environment and to one geographic area.

In order to solve these problems we need to bring together, for some consensus building, a diversity of interests and talents in order to unify the effort and develop common goals and methods and set priorities for the future. In order to accomplish that end, I propose that Congress create a National Commission on Environmetrics or Environmental Monitoring—the name certainly is not important—for the purpose of recommending to the President and the Congress a national environmental monitoring program.

The Commission should include appointees from the executive branch, Congress, State, and local governments, interstate commissions, environmental groups, conservation groups, industry, scientists, statisticians, and other experts who can contribute to the effort.

In developing its program, the commission should relate to the following issues:

No. 1, the extent and adequacy of existing manpower, laboratory, budgetary and other resources. In other words, a look at what is there now. And it is huge.

No. 2, the scope and goals of the proposed national program. I think it is important that we agree on what the scope and the goals should be.

No. 3, to bring together under one umbrella the Nation's environmental monitoring efforts with recommendations for the Federal level for shifting budgets, personnel and responsibilities from existing agencies to the new home of the program; legislation necessary to initiate and carry out the program; the importance of user orientation of the programs so that it will serve the needs of the Congress, Federal agencies, States and local agencies and others who need the information; the inclusion of strong scientific and statistical leadership.

To sum up, Mr. Chairman, the Nation continues to commit large sums—on the order of $50 billion per year—to environmental management. We don't, for the lack of a unified, scientifically valid monitoring system, know whether or not we are spending our money wisely or have our priorities right. We are, as a people, firmly committed to our environmental destination, but, Mr. Chairman, it is an expensive trip and we are flying blind.

[The prepared statement of Mr. Lyon follows:]

Statement of Walter A. Lyon

Adjunct Professor of Civil Engineering
School of Civil and Urban Engineering
University of Pennsylvania

and

Engineering Consultant
20 Clifton Road
Camp Hill, Pennsylvania

Before the Subcommittee on Natural Resources
Agriculture Research and Environment House
Committee on Science and Technology

May 19, 1983

Mr. Chairman; it is indeed a pleasure to appear before you and members of the Subcommittee today. The subject of this series of hearings has been of great personal and professional interest to me for nearly a quarter of a century. I bring to you the point of view of an environmental professional who has spent 35 years at the local, state, federal and international level and who has given a significant share of his professional energy to the problems of environmental monitoring in the capacity of Chairman of the Joint Committee on Water Quality Management Data of the Conference of State Sanitary Engineers and the Association of State and Interstate Water Pollution Control Administrators. I have also served as a member of the National Research Council Study Group on Environmental Monitoring and as Chairman of the Panel on Source Monitoring, as a member of the USGS Advisory Committee on Water Data for Public Use and as a member of the EPA STORET Advisory Committee.

For 22 years I served as Water Quality Administrator for the State of Pennsylvania, and for the past four years as Deputy Secretary for Planning of the Pennsylvania Department of Environmental Resources. I am now an Adjunct Professor of Civil Engineering at the University of Pennsylvania and a consultant in the field of environmental engineering and natural resources. I list these assignments not to burden you with details but to simply illustrate that a considerable part of my professional life has been spent with the subject of these hearings. As a matter of fact, it was my pleasure to have testified before this Subcommittee on this subject in September, 1977 and in June of 1978.

THE HISTORY OF ENVIRONMENTAL MONITORING

Before I speak to the three points which you asked me to address in your letter of April 22, 1983, I would like to say a few words about the importance of reviewing some of the history of the environmental movement and the programs which the nation has mounted in response to its growing environmental concerns on one hand and on the other hand the inadequacy of its environmental monitoring programs.

The beginning of environmental monitoring coincided with the industrialization of this nation which, in the second half of the 19th Century, resulted in the growth of urban water and sewerage systems. These systems tended to become focal points for the spread of waterborne communicable disease among the urban population. Serious typhoid epidemics in places like Pittsburgh and Erie, Pennsylvania, around the turn of the Century, and thereafter, focused the attention of our nation on a rather narrow aspect of environmental protection, that of eliminating typhoid fever by applying chlorine to drinking water systems.

The response-time (the time between the recognition of the problem and its solution) for this effort was amazingly short, probably, because health statistics (we call it effects monitoring) needed to measure program progress were available to the nation and its political jurisdictions in the form of statistics on typhoid mortality and morbidity. It was easy then and it is easy today to look at these statistics and reflect upon the introduction of chlorine to the nation's urban water systems and the resulting dramatic reduction in typhoid fever mortality among the American people.

In less than three decades (1910-1940) this nation responded to that problem in an effective way and a significant part of the success is attributable to the fact that data were available whereby cities, states and the nation could measure the success of this program. Only 10 years later (1951) Mark Hollis, then a Public Health Service Sanitary Engineering Officer in charge of the nation's environmental programs, drew our attention to the growing volume of chemicals in our surface and drinking waters and ten years after that (1962) Rachel Carson an ex-employee of the Fish and Wildlife Service, Department of the Interior, in her book "The Silent Spring" again riveted the nation's attention to the growth of chemicals in our nation's environment.

Since Rachel Carson's warning, the importance of a valid and effective national environmental monitoring system has been expressed frequently and repeatedly over the past two decades by national and Presidential Commissions, but to no substantial avail. During the period ten separate groups of experts observed and deplored the lack of a national system which provides scientifically valid information about the nations environment and the effect of pollutants on humans and natural systems which would provide a basis for management of the environment and attempt to anticipate problems, and recommended that this matter be given high priority and handled as a separate effort.

Scientists and engineers who met in Cincinnati in 1960 at a National Seminar to discuss water quality measurement and instrumentation expressed that feeling then. At a similar meeting at the University of Wisconsin in 1970, seventeen scientific and professional organizations concerned with water quality monitoring again expressed this point of view.

In 1965 the report of the Environmental Pollution Panel of the President's Science Advisory Committee chaired by John W. Tukey, (Professor of Mathematics at Princeton University) recommended that:

"(a) Immediate steps be taken to plan and institute a National Environmental Quality Survey which would provide benchmark data on the average condition of the environment of the people of the United States as a whole.

(b) An agency should be set up to carry out planning including sample design and analysis of the National Environmental Quality Survey. This agency should be isolated from all enforcement or action programs and should make the greatest possible use, through transfer of funds, of expertness in carrying out measurements of environmental quality already developed in federal, state and local government.

(c) Because of clear separation from enforcement and action, and because of long experience with sampling design and analysis, particular consideration should be given to setting up this agency in the Department of Commerce."

In 1966 Dr. Abel Wolman, Professor Emeritus of the Johns Hopkins University presented a report through your Subcommittee on Science, Research and Development of the Committee of Science and Astronautics. The first sentence in that report highlights the subject of environmental information. It occurs on Page 469, Volume 1, "A review of the present status of water, air, and land pollution and proposals for abatement thereof, makes reasonably clear that corrective legislation has quite well outrun both factual basis for action and smooth machinery for development and regulation."

Also in 1966 the Report of the Committee on Pollution of the National Research Council chaired by Athelstan Spilhaus of the University of Minnesota says in the first sentence under "areas of inadequacy" (of its publication 1400, page 18):

> "Unquestionably there is a most serious and pervading need for knowledge--for precise, reliable data that can be utilized for specifying systems design, performance, and management."

They go on to cite several examples (on the next page)

> "...we do not have nearly enough about the numerous interrelationships, implications and secondary effects involved to warrant a "full speed ahead" on applying all the technology now available" and (on page 26 recommendation #3) "That there be provided within the structure of the federal government: (a) a Center for criteria and standards to collect, compile, and issue critical data from national and international sources on acceptable levels of residue concentrations for guidance of regional and local bodies; (b) a Development Center for the testing and evaluation of systems and subsystem components, with strong ties to professional associations, industry, and state and municipal authorities."

In 1967 a task force on Environmental Health and Related Problems chaired by Ron M. Linton recommended to Secretary of HEW John W. Gardner in a report entitled "A Strategy for a Liveable Environment" recommended that the Department of HEW:

> Establish a surveillance and warning program which will, through basic research, identify current and potential problems and determine the effect of these problems on man, thus giving the Department a continuing supply of scientific knowledge necessary to protect man from environmental injury and aesthetic insult.

The Task Force also recommended:

> Development by 1970 of a nationwide surveillance system necessary for identifying levels of pollutants and components of pollutants in air, water and soil.

In 1967 a Task Force on Environmental Health of the National Commission on Community Health Services recommended:

> Development of analytical methods and instrumentation and detection identification and measurement of potentially harmful chemical agents and biological and physical forces.
>
> Definition of sources, movement, and action, and pathways to man. Determination of effects of such agent and forces.

In 1968 the Synopsis of the Proceeding of the Symposium on Human Ecology sponsored by the U.S. Department of Health, Education and Welfare, was summarized by Ron Linton as follows:

> "The Consumer, Protection and Environmental Health Service (of HEW) must be the lead agency in formulating and implementing a new national philosophy. It must have four resources to implement strategy (two of the four related to monitoring):

1. A science base in order to identify what is in the environment.

2. The ability to establish criteria and standards...etc.

On page 90 the report elaborates on "tools to implement the strategy."

> "First it must have the resources to identify all that is injected into our environment, in the air, in the water, on the land, or in the space we live. It must be able to examine and access the impact on human health or whatever man puts into his environment. It must be able to examine these effects individually and synergistically. It must be able to determine not only where they come from but why and what they do to the physical environment and how they affect man."

In 1970 the report of the Environmental Study Group to the Environmental Studies Board of the National Academy of Sciences Institutions for Effective Management of the Environment on page 40 recommended as follows:

> "We recommend that development of federal programs for comprehensive and systematic monitoring of environmental quality be given highest priority. It could be carried out by a new independent agency or an existing agency. The Board of Environmental Affairs recommended in this Report should turn its attention to developing comprehensive monitoring programs as soon as possible after it becomes operational.
>
> The monitoring function should be based initially on the work currently underway in the various specialized environmental agencies and bureaus. Many of these, such as the Atomic Energy Commission, will have a need to continue their specialized monitoring activities. However, most of the environmental monitoring activities of the federal government should be centralized.
>
> The stated objectives given some indication of why an agency with central responsibility of all monitoring is an essential mechanism. Measurements must be designed to yield environmental quality indices and to indicate when changes in the environment require counter action. It is doubtful that the environment will ever be understood if we measure, for example, whether only at airports and airborne pollution only in the centers of cities, or if observation stations are moved every time a new airport is built."

And so it goes. Testimony presented by Dr. Stuart Hunter during the September, 1977 hearings summarized the recommendations of the Study Group on Environmental Monitoring of the National Research Council as follows:

> The NRC study group's analyses and recommendations were concerned solely with the EPA. However, almost all its findings are pertinent to the immediate concerns of this subcommittee.
>
> Perhaps, the major criticism of the study group is best quoted:
>
>> "EPA does not adequately apply scientific principles to the design, operation, and evaluation of monitoring programs.

> Programs are too often developed hastily in response to the dictates of legislation and enforcement procedures and the exigencies of pollution control management, instead of being based on clear objectives, priorities, and criteria related to a national monitoring system. As a result, current monitoring does not adequately serve the important purposes of evaluating the progress of national environmental programs in terms of changes in environmental quality and of determining relationships among sources of pollution; ambient environmental quality; and effects on humans, animals and plants."

A major recommendation of the study group was "that, within the EPA Administrator's office, an Office of Science be established to exert scientific leadership***." It was also recommended that the "EPA, through its Office of Science, base its proposals and design for ambient monitoring networks on prototype studies developed in cooperation with other Federal agencies and the States."

The study group also recommended that a certification program be established for all laboratories participating in environmental monitoring. The study group also noted that EPA's problems of management of scientific data were exacerbated by the short supply of statistical talent within the Agency.

The committee also recommended that careful planning begin for long-term multicity studies on the effects of air pollution on human health, including the study of both acute and chronic diseases.

A final recommendation of the group was that a National Committee on Environmental Monitoring be established to coordinate Federal environmental monitoring efforts.

These national advisory bodies representing a great diversity of expertise and interests, which have separately and independently been asked to review and comment on national environmental program needs, have urged that the highest priority be given to the monitoring task. Their explicit, emphatic and unified voice over the past two decades underscores the importance and urgency of the subject of these hearings.

Fedeal Monitoring Represents Only a Small Share of the National Effort - It is important to reiterate that the 1977 Report on "Environmental Monitoring" of the National Research Council/National Academy of Sciences was focused on Monitoring programs in EPA. It did not address very substantial monitoring programs that exist in other federal agencies such as the Department of the Interior, the Department of the Army, the Department of Commerce, the Department of Agriculture and Commissions such as the Delaware River Basin Commission, the Susquehanna River Basin Commission, the Ohio River Valley Water Sanitation Commission (ORSANCO), the Interstate Commission on the Potomac River Basin, the New York/Jew Jersey Port Authority and international commissions such as the International Joint Commisssion as well as the very substantial environmental monitoring programs which exist at the state and local levels.

In the latter connection, I draw your attention to the October 5, 1977, letter to your Subcommittee from Ronald B. Robie, Director of the State of California, Department of Water Resources, because he points out that a 1974 analysis of water oriented data collection in California showed that non-federal groups including state, local and private entities invested three to four times as much effort as the federal government in the field of environmental monitoring. Based on my own experience, I am convinced that this is so. Any approach to the Environmental Monitoring effort must broaden its scope beyond the limits of EPA's monitoring efforts and include those being conducted by federal, interstate and international agencies as well as state and local government.

The National Monitoring Effort is Huge - The Results are Puny - If all the personnel and fiscal resources that go into the collection, laboratory analysis, statistical analysis, distribution and reporting of data in the environmental monitoring field are put together, I assure you that we would be very surprised at the size of the effort and the expenditures dedicated to monitoring in this country. There are about 150 federal environmental monitoring systems which, in 1978, cost the nation $730 million. The problem is that the effort is fragmented, duplicative and wasteful, and in many cases it is devoid of scientific validity and leadership. Too often, data are collected, stored and never analyzed. Its meaning and its implications are rarely brought to the attention of the decision makers that need the information in order to proceed with the job of cleaning up the nation's environment.

I do not here mean to overlook fine examples of local or regional monitoring such as the work of ORSANCO, the International Joint Commission, and here on the Potomac where local leadership has resulted in excellent work. My criticism relates to the lack of federal leadership in this field.

The Federal Role Has Been to Maintain the Fragmentation and to Impose it on the State Level - As a result of the concern of this Subcommittee in 1977 and the report by the National Academy of Sciences, the President, in 1977, directed the Council of Environmental Quality to establish an Interagency Task Force to review environmental data and monitoring programs and to make recommendations that would improve the effectiveness of these programs. The problem with that Task Force and with its report was that it limited itself to the federal establishment. It did not involve state and local governments and commissions and others who collect the overwhelming volume of monitoring information as a result, for the most part, of very specific federal requirements. One of the key recommendations I would have for the future relates to the importance of bringing together a representative group of people from all levels of government who participate in the environmental monitoring job. I am reminded of a similar successful effort in the 1950's. The National Office of Vital Statistics in the Department of HEW annually brought together people from throughout the nation, notably from local, state and federal government, who participated in the job of collecting and analyzing health statistics relating to the health of Americans. Each year these experts and workers would meet here in Washington in the (old HEW) South Office Building. They were assigned to working groups and task forces and together they molded and shaped what is today the nation's vital statistics reporting system. It was a useful and unifying effort wherein the federal government exhibited its proper role, that of providing leadership to the nation in this unifying effort. As a result of this, we have good information, using criteria and methods arrived at by consensus from all levels of government about the health problems of Americans and can use it to plan our programs.

ANALYSIS OF ISSUES

In response to Item 2 of your letter "information on the current state of environmental monitoring," I am sure you are aware that I could not conceivably have a broad overview and sufficient detailed data to adequately answer your request for "Information on the current state of environmental monitoring." But based on my limited window of experience, and by participation in intergovernmental and professional affairs, I can give you my personal and professional responses to your questions about the issues as you list them.

Question - Policy Making--Are Pollution-Control Statutes Effective in Cleaning Up the Environment?

The information to answer that question is not available for the nation as a whole. It may be available for some specific areas such as the mainstem of the Ohio River, the Great Lakes System (due to the outstanding monitoring job being conducted by the International Joint Commission) and for certain other isolated areas where either the USGS or others have done water quality assessment studies. Similarly there is limited information about air pollution problems and improvement for some selected urban areas. That information will tell you whether or not pollution clean-up is occurring. It does not tell you whether the pollution control statutes are as effective as they could be. Considering the $50 billion the nation is investing in this program each year, this puts the Congress and the President in a very difficult position. We may or may not have our priorities right. We may be wasting public and private money in one area and spending too sparsely in another. To put it simply, we're flying blind with a very expensive airplane and a very delicate cargo.

In Pennsylvania, where we have kept statistics for the water pollution field based on the net gain in streams cleaned up each year, we find that the net gain has been falling since the early 1970's has now reached almost zero and my own observation is that this is due to the tremendous growth in the volume of regulations and associated red tape which keeps personnel, who ought to be in the field working on pollution clean-up, in the office filling out federal forms. This highlights two aspects of our pollution control statutes and programs that need specific attention.

(1) The first relates to the tremendous increase in paperwork and red tape which apears to be counter-productive to what we are trying to accomplish--cleaning up pollution; and, (2) the federal imposition of its own highly fragmented system of monitoring upon the states and makes it increasingly difficult, if not impossible, to unify environmental monitoring programs at the state level in order to eliminate the very harmful fragmentation. For example, there is simply no way that a state can in a unified wholistic way meet the federal requirements relating to monitoring of surface mines, air pollution, hazardous wastes, water quality and toxic substances. In every case the federal government requires separate, different monitoring systems reflecting the fragmentation at the federal level. The same is true for the issue of red tape. When we recently analyzed the growing volume of regulations in the Department of Environmental Resources in Pennsylvania, we found that over 70% of our regulatory statements, and we now have in the order of 17,000, are federally mandated, and we have no option but to adopt them unless we are to lose the federal primacy in such programs as hazardous wastes, NPDES and the Department of the Interior's surface mining program. So my answer to your first question is--no, not as effective as they could be.

Question - Do High Quality Baselines Exist so that Future Monitoring will Allow Assessment of Changes?

The answer to this is that they exist in a few locations where a good job is being done. For example, the work of the International Joint Commission and ORSANCO in this field has been excellent and does provide high quality baselines that will allow future assessment of changes. But this is not a matter of national policy as it ought to be.

Question - Is Ambient Monitoring Adequate to Assess the General State of Environmental Quality and of Trends?

The answer is no. In most cases, by itself and the way it is now practiced it is not adequate simply because in order to answer the question pollution should be measured both at the local level and on a regional level. The most dramatic impact of pollution occurs at the local level. For example, the emissions of a fossil fuel power station may cause very significant adverse local effects. Unless a monitoring system is designed to measure those effects (considering carefully the micrometerology of the situation), progress in connection with that particular source is not likely to be measured by a more distant ambient system.

Our ambient monitoring system as presently constituted do not measure clean-up progress or degradation immediately downstream from the hundreds of thousands of discharges from industries, municipalities and mines. In order to overcome that problem, we in Pennsylvania asked our field people to report annually which point discharges have been cleaned up (or degraded), the stream distance that has been affected and the reason for the change. In complex situations this kind of effort needs to be supplemented by an intensive study in order to carefully measure what has occurred. Ambient monitoring systems as presently constituted do not adequately represent the story for our many thousand emissions by state and local staffs, and the judgement and experience of trained personnel who are familiar with the area. Congressman Jones, Chairman of the House Committee on Public Works in the 1950's, raised the same question and expressed the view that the nation is entitled to the information. We still do not have it today.

Question - Are Indicators Adequate to Anticipate Future Problems?

Monitoring to anticipate future problems is in its infancy and deserves much more attention that it is given. For example, on Page 250 of your September, 1977 hearings Professor Colwell, University of Maryland, mentions a "mussel watch" program which was then being conducted by EPA's Naragansett Laboratory. Such a program can be extremely useful in providing an early warning of pollutants in the water phase of the system that will tell us about problems. Similarly, the U.S. Fish and Wildlife Service has a tiny program of looking for cancer tumors in fish which is being conducted by the Columbia Ohio National Fishery Research Laboratory. This type of program shoùld be expanded greatly to give us an early warning of problems we are likely to encounter in man and other elements of the environment.

Monitoring biological indicators can be very helpful in giving us an early warning of problems but these alone are not enough. We need to look much more broadly at "indicators" in our technology and their potential impact on the environment.

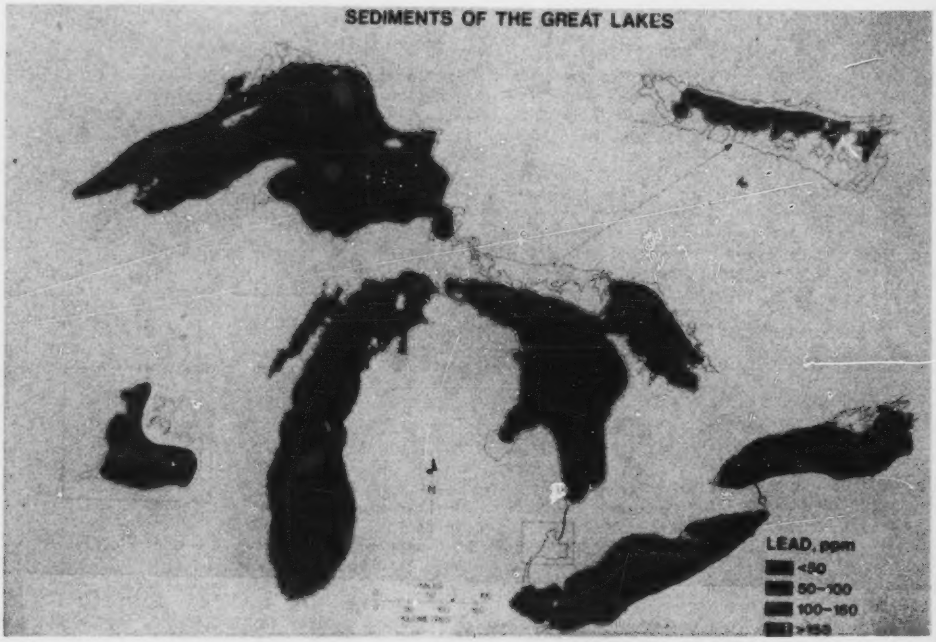
SEDIMENTS OF THE GREAT LAKES
LEAD, ppm
<50
50–100
100–150
>150

FIGURE 1

Question - Have Existing Problems Been Adequately Evaluated (e.g., Hazardous Waste Sites)?

The answer is clearly no. We have mounted a massive program to clean up existing hazardous waste sites without very much information concerning the national problem and its impacts on the environment. In my testimony on Page 280 of your September, 1977 hearing (Item 6), I drew attention to this problem and pointed out that we really don't know very much about the use, storage and disposition of toxic chemicals in this nation today. Let me remind you that now, 21 years after Rachel Carson drew our attention to this problem, we know shockingly little about the problem, that's why we are constantly surprised by new horror stories which have too little scientific substance. The 1981 annual report of the Council of Environmental Quality points out that very little has been done in the identification of hazardous air pollutants pointing out "that currently there are very few data on the potential effects of such substances in the quantitites found in ambient air." "Over the past 11 years standards have been set for only four hazardous pollutants (beryllium, mercury, asbestos and vinyl chloride). Thre others (arsenic, benzene and radionuclides) have been listed as potentially hazardous but no standards have been promulgated." To use a medical analogy, we are, in some program categories, spending a lot of money treating a patient we have not adequately diagnosed.

Question - Is Monitoring for Toxic Substances (air and water) Adequate to Evaluate Environmental Quality?

The answer is clearly "no", if "evaluation" means, information needed to make decisions about where the sources of pollution are. We know, for example, that the total deposition of air-borne trace metals to the Great Lakes and of organic substances is very significant. For example, in 1981 a CEQ report indicates that "available data suggests that atmospheric deposition may contribute 60 to 90% of all PCB input to Lake Superior in Michigan". That report also shows that 4,689 metric tons of lead per year is deposited in the Great Lakes system. Figure (1) shows the presence of lead in the sediments of the Great Lakes system. As you can see, it is very significant in the Lower Lakes. (I obtained this information from the Canadian Government.) It is estimated that 50% of lead in the Great Lakes comes from air-borne deposition. But we do not know most of the sources of this lead but we do not have anough information about the sources of toxic organics - very few are being monitored. This shows the gap, the fragmentation that exists in trying to put together the story about toxic and hazardous substances. How can we manage the environment of the North American Continent if the information comes to us in such piecemeal fashion?

Question - Are Data Networks and Data Gathering Programs Properly Designed?

Clearly the answer to this question is "no". They are highly fragmented, objectives and goals are sometimes not established and sometimes unclear because they are not necessarily focused on the most important problems. For the most part they are being conducted by agencies that have a program mission which represents only a small part of the ecosystem and, therefore, the data does not provide the linkages that are needed to make decisions about the system as a whole. For example, in the early 70's we spent much time abating pollution from the Great Lakes only to find that a significant share of the organic and inorganic pollution comes from air-borne particles.

Question - Do Environmental Data Receive Adequate Quality Assurance?

The answer is clearly "no". Before adequate quality assurance can be obtained, there is a need for experts to come to some agreement concerning ways to analyze and measure pollutants. This has been done in the water field through the long-standing efforts of the Joint Committee on Standard Methods of Water and Wastewater Analysis. Unfortunately, EPA will not accept the consensus of this group and imposes its own analytic methods (which are often difficult for operators of small systems to do). However, these measurement methods need to be agreed upon across the entire scope and diversity of environmental programs and be agreed upon across all levels of government and this has not been done. It is a prerequisite to the establishment of an adequate assurance program.

Question - Are General Requirements for Monitoring Being Subordinated to Individual Agency Requirements?

The answer to this is clearly "yes" but in fact it is not even related to agency requirements, but in nearly every case to a subsidiary program element of a particular agency. For example, EPA monitoring requirements for air pollution bear no reasonable ecologic relationship to the monitoring requirements for water quality. The drinking water program in EPA has a monitoring effort that does not relate to other water monitoring efforts such as those of OSM and the water pollution program in EPA or the various water monitoring efforts of USGS. For example, EPA's drinking water program requires all community drinking water supplies to analyze for Methoxichlor, Endrin, Lindane, Toxaphene, 2-4D, 2-4-5T Sylvex but not the chemicals which due to nearby pollution sources may contaminate the source of any given supply.

Question - Should Environmental Monitoring be Decentralized to the States--What Would be the Impact?

In part, that is the present situation, but the format in which it occurs is very damaging to state programs because monitoring requirements are being imposed upon the states by a wide diversity of federal programs in a highly fragmented uncoordinated way. The answer clearly is that what is needed is a national monitoring effort that is put together with goals designed to meet the requirements for scientific program and public policy decisions at the national, regional, state and local level. This is a similar requirement to the programs being conducted by our health statistics program and by our weather service. There is no reason why it cannot also be done in an orchestrated way with the participation of local, regional, state and local people in order to meet common environmental management goals.

Question - Is There an Overall Policy-setting Body for Environmental Monitoring? (Arguably CEQ has Stautory Authority)

I do not believe that there is an overall policy-setting body for environmental monitoring. The authority of CEQ is limited by the wording of Section 204 of the National Environmental Policy Act of 1969, as amended; which allows the Council to gather information and to "review and appraise the programs and activities of the federal government." It also has the power to develop and recommend policies to the President, to conduct investigations, to document and define changes in the environment, and to report to the President. There is no power in the Act which gives the Council authority to direct and manage a national environmental monitoring program.

Question - Is funding adequate for monitoring needs?

While I have no detailed information about the funding of monitoring programs within the intergovernmental structure, I am confident that there are adequate funds for monitoring in the governmental budgets at the federal, interstate and local levels. The problem is that the funds are being spent in such a highly fragmented and inefficient way that a great deal of money is being wasted. In my 1978 testimony I referred to the problem of federally funded laboratories and estimated that within a 50 mile circle of Philadelphia there must be at least 100 laboratories among federal, state and local agencies all supported by federal funds. The same is no doubt true about computer systems and field collection programs. Any effort to unify the environmental monitoring requirements among federal agencies are likely to attain very significant economies which will allow the system to accomplish much more with presently available funds than is now being accomplished.

Beyond the areas normally considered environmental monitoring, there is the need to include environmental mapping of land use characteristics that are relevant to the management of the environment. The mapping of hazardous waste sites, active and abandoned mines, water supply sources, industry emissions to air and water, ecologically fragile areas such as wetlands, natural areas and primitive areas need to be orchestrated in a way that enhances data storage, updating and retrieval using modern cartographic and digital mapping methods. The duplication and fragmentation in this area is costly and wasteful and has costly adverse effects on government programs such as the preparation of environmental impact statements and application for permits where mapping coordination using modern techniques would save much time and money.

Question - Should non-governmental institutions have a role in ambient monitoring and how should this be encouraged?

Clearly, non-governmental institutions such as universities and research laboratories should play a role in monitoring. That role has to be very selective but we have found, in many cases, that univeristy laboratories and others were way ahead of the game. For example, it was a graduate student who discovered the problem of mercury in fish in the Great Lakes.

When we became awa.e of the problem of phosphate nutrients in the Great Lakes system, we found to our dismay that no government research effort had touched this problem and the only information that was available to us came from private consultants and university research. This type of effort should be encouraged as part of an overall unification of the nation's environmental monitoring effort which I will cover in my recommendations below. In addition, there is considerable need to step up research that develops better monitoring techniques across program, scientific and ecologic boundaries. Most research in this field has been limited to very specialized areas.

RECOMMENDATIONS FOR THE FUTURE

In my 1977 testimony I recommended the establishment of a National Commission on Environmetrics (the name is not important). My recommendation at that time was limited to a Commission that would study the problem and report back to Congress. That option is still available to us but five years have passed and the situation appears more serious and more urgent than ever. I, therefore, continue to recommend that we establish a Commission but I have modified and supplemented my recommendations, and now recommend as follows:

I propose that Congress create a National Commission on Environmetrics for the purpose of recommending to the Congress and the President a program that should be implemented to create a National Environmental Monitoring Program. The Commission should include appointees from the Executive branch, the Congress, state and local government, interstate commissions, industry, environmental, conservation and health groups, scientific and academic experts.

The Commission would be required to issue its report within two years of its creation.

Its proposed program should include institutional, organizational, budgetary, scientific and legislative elements, as well as a statement of goals and objectives for the program.

In developing its proposed program, the Commission should relate to the following issues:

1. The existing governmental environmental monitoring programs in the nation in order to determine and evaluate the extent and adequacy of manpower, laboratory and budgetary resources.

2. Develop a program to bring together, under one umbrella, an appropriate share of the nation's monitoring resources for the purpose of establishing a national environmental monitoring program that meets the needs of the federal government, interstate and international commissions, state government and local government and environmental, conservation and industry groups.

3. Establish the goals of the program and the degree to which we need to broaden the scope of the nation's environmental monitoring program in order to produce useful information regarding the interrelationship between pollutants, humans and ecologic systems.

4. The organizational and institutional framework and user orientation which will be required to keep the program effective and useful to federal, state, regional and local agencies which have responsibilities in environmental protection.

5. To assure strong scientific and statistical leadership in the management of the system, including improved systems design, flexibility, evaluation, data and laboratory quality control.

6. The need for research education and training, especially for federal, state and local personnel, in environmental monitoring methods.

7. The Commission should in its report include recommendations for (1) shifting budgets, personnel and responsibilities from existing federal agencies to the national program and (2) legislation necessary to initiate and carry out the program.

8. In the pursuit of its objectives the Commission should be required to plan and initiate an annual national workshop on environmental monitoring to bring together experts and workers at all levels of government and from all types of environmental programs in order to develop consensus about scientifically valid monitoring objectives and assessment strategies, common data elements, monitoring instruments, data management, statistical and analytical, reporting and mapping criteria and methods. (This effort should help gradually attain a measure of compatibility among a host of divergent monitoring systems. It should also help to improve data compatibility, quality assurance, use and interpretation.)

SUMMARY

In summary, Mr. Chairman the need for a unified approach to environmental monitoring has been reiterated at the national level by at least 10 committees of experts over the past several decades. They said that sound management of the nation's environment required a national monitoring program.

The nation continues to commit large sums---on the order of $50 billion per year to management of the environment. We don't, for the lack of a scientifically valid monitoring system, really know whether we are spending this money wisely or whether we are making as much progress as we could. We are on an expensive trip, committed as a people to our environmental destination, but flying blind. Our monitoring effort is large and expensive, but the results are puny, because it is fragmented, too often lacks scientific validity and rarely anticipates problems before they occur. If we could do a better job of monitoring to anticipate, we might significantly reduce the cost of the program, because prevention is usually less costly than the cure. The results are puny, also because we have tried to approach the problem as a federal problem rather than a national problem; and we have unwisely used the regulatory approach when consensus building among all levels of government is likely to bring better results.

To solve this problem we need to extract, painful as it may be, from existing programs important elements of their monitoring programs, so that they can be unified and produce the information needed to manage the nation's environmental programs more cost effectively. If we do this we will probably speed up the pace of environmental clean-up without increasing its costs.

We do not need a host of regulations and guidelines but we do need leadership that brings together the many highly competent and dedicated people at all levels of government and in our universities who can contribute their talents toward a more unified, meaningful effort.

Mr. **Scheuer**. Very good, thank you very much, Mr. Lyon.

Now we will hear from Dr. James Reisa, vice president and general manager of IDEA *TECH Associates.

Dr. **Reisa**. Mr. Chairman, members of the subcommittee, thank you for inviting me to appear before you today for the purpose of contributing some background information and recommendations that I hope will be helpful in your evaluation of the Nation's environmental monitoring programs.

You have asked me to address the findings of the 1980 report of the Interagency Task Force on Environmental Data and Monitoring, which the Council on Environmental Quality convened in response to President Carter's 1977 environmental message. I served as chairman of that task force during an early phase of its effort. You further requested that I address the current state of environmental monitoring programs and offer recommendations for improvement.

I have been out of the Government for nearly a year, so most of my knowledge of Federal programs reflects pre-1982 conditions. I see that you have invited other witnesses who are able to address current Federal programs, however, and I understand that the subcommittee mainly desires that I speak today from perspectives I acquired in past Federal service.

During the Nixon, Ford, and Carter administrations, from 1974 to 1978, I was the staff member in charge of CEQ's environmental data and monitoring program. In that capacity, I appeared before the predecessor of this subcommittee on September 13, 1977, to describe the task force and its goals. A few months after that appearance, I accepted a position at the Environmental Protection Agency, where I served until 1982.

Since I am now a private citizen, I wonder if I might be permitted to digress for just a few seconds before addressing the topic at hand to offer sincere compliments to the subcommittee and your outstanding staff for your recent role in illuminating the problems at EPA.

I believe that those efforts are also very much appreciated by many of the present career staff in EPA who will not have a similar opportunity to express it in person.

As the troubles at EPA unfolded over the past several months, it seemed to be well known around Washington's environmental community that among the several congressional committees working diligently on the matter, one of the best sources of straight facts was this subcommittee.

Now, as Mr. Ruckelshaus takes charge at EPA and attention turns to the task of restoring that agency to effective performance of its mission——

Mr. **Scheuer**. If you think you are embarrassing us by all of that fulsome praise, you are absolutely wrong.

Dr. **Reisa**. Thank you, Mr. Chairman. In that case, I will continue.

It is noteworthy, I think, that this subcommittee is turning to focus so quickly and constructively on getting straight facts in yet another way, through seeking to improve the Nation's environmental monitoring programs.

In preparing the statement I am offering today, I sought to augment my personal knowledge by contacting several colleagues who had been major participants in the task force, including those who chaired the effort after I moved to EPA.

The task force summarized its findings and recommendations in its final report, dated March 21, 1980. I gather that the final report itself is merely an executive summary of the work accomplished by the task force, and that most of the detailed documentation, including several draft Executive orders and interagency agreements, are still at CEQ. At least I am not aware of their subsequent release or implementation.

The final report contains the following: a description of the task force and its purpose; a brief summary of the task force's inventory of environmental monitoring activities; a listing of 38 issues and concerns identified by previous studies of Federal environmental monitoring programs; and a discussion of major problem areas and 13 specific recommendations for improvement

As you know, the Interagency Task Force on Environmental Data and Monitoring was by no means the first to address shortcomings in the environmental data and monitoring programs supported by the Federal Government. In fact, the task force was convened largely in response to previous critical evaluations by those you have mentioned, and particularly the predecessor to this subcommittee, then chaired by Mr. Brown.

The task force was convened by CEQ in September 1977. Nineteen agencies participated in it. Before discussing its findings, I would like to offer a personal observation that the task force turned out to be a rather refreshing forum for informed soul searching by senior officials of the 19 participating agencies, who, to their credit, generally managed to look beyond the specific missions, needs and interests of their individual programs.

I further believe that the task force produced some sound recommendations that were responsive to many of the past criticisms, recommendations that the career staff of the participating agencies seemed ready and willing to embrace. Unfortunately, most of those recommendations since appear to have become sidetracked by the cyclical nature of the executive branch of the Government.

The task force was designed to operate by forced consensus. By that I mean that failure to reach a responsive consensus on major issues was not an allowed option. The work of the task force was performed mainly by senior staff and managers from the participating line agencies, with CEQ acting in its traditional role of collegial gadfly and facilitator.

At the beginning, the task force seemed ready to be candid and cautiously optimistic about achieving some program improvements. The participants refrained for the most part from denying or attempting to rationalize the technical and program deficiencies that outside reviews had identified over and over again. Many could have turned, with some justification, to familiar tactics of excusing such program deficiencies on the basis of statutory limitations, budget constraints, competing priorities, and other historical or technical realities.

Once the task force participants got started, though, they showed a desire to make sensible changes. This was a real opportunity. The new Carter administration in 1977 had a fresh mandate and sought improvements. The Congress, especially Chairman Brown, expressed a very supportive attitude and a desire to help. The President's reorganization project was also very supportive.

The first order of business, largely at the encouragement of OMB and the President's reorganization project but also because it seemed to be needed, was to tackle the massive job of sorting out and documenting what the task force sought to analyze.

The survey resulted in extensive documentation. Based on fiscal 1978 programs, the task force identified more than 150 specific Federal environmental monitoring programs with budgets totaling approximately $730 million, not counting the undeterminable numbers of programs and resources that were closely mixed with other associated activities and impossible to isolate for analysis.

Although I moved to EPA soon after the survey was completed and was unable to remain active with the task force, I have been told that the survey proved to be useful as a source of data in the subsequent work.

Former task force participants have informed me that by the time they were ready to begin writing the final report in 1979, outside support had diminished quite a bit.

The task force participants, however, chose to continue their efforts in spite of the lessening of support. When agency staff persevere in an effort that lacks active political support, specific statutory mandate, or prospect of more resources, it often indicates that they are on to real problems and needs with a good chance of solving at least some of them.

Seven of the task force's 13 final recommendations addressed the need for better coordination, and it is not difficult to appreciate why. A typical Government program is given a specifically defined statutory or administrative mandate, must operate with presently available technology and Federal procedural requirements within a set budget, must satisfy a particular constituency, and must deal with other organizations in acceptable ways. A manager responsible for such a program may be hard pressed to accomplish all of that, and the introduction of major new requirements or external criticisms often exceeds the capability of an individual program to respond without outside help.

For example, EPA's main water quality data system, STORET, originally was planned to serve as a large automated repository in which Federal, State, and local users could each benefit from a national economy of scale in computerized data storage. The STORET program generally achieved that goal, but it mostly was storing other people's data.

The STORET program has been criticized heavily over the years. Those criticisms certainly identify important needs, but it has been difficult for the STORET program to respond except as its mandate and budget have permitted. Many of the criticisms remain unsatisfied.

Many other Federal programs are in a similar situation, because their original scope and design did not foresee or attempt to meet national needs that transcend the specific goals they were planned to serve. On the other hand, those transcendent needs are real regardless of when they are recognized, and they are going to be heard over and over again until they are satisfied.

In the area of the coordination, the task force's first recommendation was to establish a national environmental statistics program, led by CEQ with interagency participation. Over the past decade, CEQ has held responsibilities under the National Environmental Policy Act of 1969 and the Environmental Quality Improvement Act of 1970 to report annually on the Nation's environmental conditions and trends and to foster the generation of better information by all Federal agencies.

Some accomplishments can be identified, but CEQ has never really had the resources or authority to bring about anything approaching Government-wide coordination. Without some sort of effective Federal mechanism for interprogram coordination, studies such as the Global 2000 report to the President in 1980, and many reviewers will continue to find appalling gaps, inconsistencies and redundancy among environment-related statistical programs of various agencies.

The situation appears to be even worse today than it was at the time of the task force's report. Budget reductions have devastated many statistical programs, some of which may be difficult or impossible to resurrect or even document properly. The main locus of interagency statistical coordination for many years, located at OMB and then in the Department of Commerce, has been dismantled.

CEQ's statistical reporting program, which produced many of the data used in its annual reports and other studies and was beginning to generate reference documents like Environmental Statistics, 1978 and Environmental Trends, 1981, appears to be terminated.

The Conservation Foundation's State of the Environment report, 1982, which Chairman Scheuer mentioned, was a laudable attempt from the private sector to maintain and disseminate information from some of the 400 key data series that CEQ and collaborating agencies had developed in its program, but funding limitations prevented them from accepting the entire burden.

I would hope that Dr. Davies, when he appears before you, will be able to discuss that further.

Another task force recommendation in the coordination area was to create a national ecological program. I have seen an almost similar proposal for about 11 years now. I must confess a special interest in that proposal, since my doctorate is in ecology.

For the past 2 years, I also have had the privilege of serving as the elected chairman of the Ecological Society of America's 2,400-member applied ecology section. Although it is impossible to speak for all of our members, I believe most would agree that the fragmentation and lack of coordination among ecological science programs in Federal agencies is clearly an impediment both to good science and to good government.

Ever since the enactment of the National Environmental Policy Act, every Federal agency has managed to acquire at least a few token ecologists, but I doubt that anyone would call that an optimal program design.

The focus, coherence and enhanced information interchange that could be achieved by better Federal coordination of its ecological programs would be of great help toward that goal.

Regarding the task force's proposals for a long-term ecological measurements program and an ecological data exchange, I would have to say that the long-term ecological research program of the National Science Foundation has been doing an excellent job of achieving much of what I think the task force had in mind.

One area in which more action seems to be needed is the need for collection of some of the more routine time-series data that could support better analysis of certain regional and global trends, and also help in validating predictive models, if properly coordinated with research activities at the LTER sites.

This suggestion first arose in 1981 during a discussion with Dr. Eugene Likens, then president of the Ecological Society of America. It was proposed in a budgetary initiative by EPA, but was not funded.

The task force's proposals to improve interagency coordination of water, natural resources, land use, and international environmental data programs have not been implemented as far as I am aware. I am aware that the Geological Survey's Office of Water Data Coordination continues to perform its valuable interagency liaison function pursuant to OMB Circular A-67, with added responsibilities inherited from the old Water Resources Council. I do not believe that the task force's proposal for enhancements has been pursued, however.

The task force's proposals dealing with multidisciplinary and cross-media analysis capabilities and the phased implementation of an integrated Federal environmental data system arise mainly from two conflicting realities. First, most Federal data programs are limited to specific boundaries in ways and for reasons I discussed earlier.

Many of these programs address only a single environmental medium or technical discipline. The conflicting reality is that many public policy and regulatory decisions require information that compares two or more such factors. Too often this means that the data cannot be compared using a single data system, or even that they cannot be analyzed meaningfully at all because of spatial, temporal, analytical, or other differences in the data collection by different programs.

Mr. SCHEUER. Can we ask you to wind up now?

Dr. REISA. Yes, sir; I will complete it in just 1 minute.

The final task force recommendation I would like to mention concerns what might be interpreted as a fundamental flaw in the budget process. On the one hand, better interprogram and interagency cooperation and coordination obviously can produce great benefits in efficiency and cost saving, as well as improved program performance.

On the other hand, many programs have been punished, in effect, for trying to achieve those goals by their own initiative. This occurs whenever you have an interagency program with key elements in several agencies. If one drops out during the budget process, the program won't work.

The task force recommended alterations in the budget process. I am not aware of any followup to that proposal.

In conclusion, I believe that the interagency task force provided a useful forum in which Federal program officials shared information, examined the problems jointly, and explored mechanisms for improvement. At a minimum, the task force's findings and recommendations can help indicate to the Congress and others what senior staff inside the line agencies believe to be needed and feasible.

However, I also believe that the task of building an adequate national environmental monitoring system is beyond the capacity of the executive branch by itself. Informed oversight and new legislation from the Congress would seem to be needed to assure the necessary widening of perspectives and the continuity of effort that the executive agencies often find difficult to muster and sustain.

That concludes my oral remarks Mr. Chairman.

[The prepared statement of James J. Reisa follows:]

STATEMENT OF

JAMES J. REISA, PH.D
VICE-PRESIDENT AND GENERAL MANAGER
IDEA*TECH ASSOCIATES, INC.
5205 LEESBURG PIKE, FALLS CHURCH, VA 22041

BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH, AND ENVIRONMENT
OF THE
HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

MAY 19, 1983

Mr. Chairman and Members of the Subcommittee, thank you for inviting me to appear before you today for the purpose of contributing some background information and recommendations that I hope will be helpful in your evaluation of the nation's environmental monitoring programs.

You have asked me to address the findings of the 1980 report of the Interagency Task Force on Environmental Data and Monitoring, which the Council on Environmental Quality (CEQ) convened in response to President Carter's 1977 Environmental Message. I served as Chairman of that task force during an early phase of its effort. You further requested that I address the current state of environmental monitoring programs and offer recommendations for improvement.

I have been out of the government for nearly a year, so most of my knowledge of federal programs reflects pre-1982 conditions. I am presently a co-owner of IDEA*TECH Associates, an information technology consulting firm and computer systems dealership with principal offices in

Falls Church, Virginia. I have kept up-to-date on certain environmental issues through work with several of our clients, but more than 95 percent of my company's business is with the private sector -- mostly small firms and scientific or technical organizations. I see that you have invited other witnesses who are able to address current federal programs, and I understand that the Subcommittee mainly desires that I speak today from perspectives acquired in past federal service.

During the Nixon, Ford, and Carter Administrations from 1974 to 1978, I was in charge of CEQ's Environmental Data and Monitoring Program. In that capacity, I appeared before the predecessor of this Subcommittee on September 13, 1977, to describe the Task Force and its goals. A few months after that appearance, I accepted a position at the Environmental Protection Agency (EPA), where I served as the Director of the Environmental Review Division, then Deputy Director of the Office of Toxic Substances, and finally Director of the Office of Exploratory Research. In June, 1982, my government service ended in a less-than-amiable encounter with former EPA Administrator Anne Gorsuch (Burford).

Since I am now a private citizen, I wonder if I might be permitted to digress for just a few seconds to mention something that I believe many of the present career staff of EPA would like to say, but lack a similar opportunity. I would like to offer sincere compliments to this Subcommittee and its outstanding staff for your recent role in illuminating the problems at EPA. As EPA's troubles unfolded over the past several months, it seemed to be well known around Washington's environmental community that among the several congressional committees working diligently on the matter, one of the best sources of straight facts was this Subcommittee.

Now, as Mr. Ruckelshaus takes charge at EPA, and attention turns to the task of restoring that agency to effective performance of its mission, it is noteworthy that this Subcommittee is turning to focus so quickly and constructively on getting straight facts in yet another way -- through seeking to improve the nation's environmental monitoring programs.

In preparing the statement I am offering today, I sought to augment my personal knowledge by contacting several colleagues who had been major participants in the Task Force, including those who chaired the effort after I moved to EPA. I also learned what I could from present CEQ staff. Since the Subcommittee already possesses copies of the Task Force's Final Report, I assume that you already intend to make it a part of the record of these hearings.

FINAL REPORT OF THE TASK FORCE

The Task Force summarized its findings and recommendations in its Final Report, dated March 21, 1980. I gather that the Final Report itself is merely an executive summary of the work accomplished by the Task Force, and that most of the detailed documentation, including several draft executive orders and interagency agreements, are still at CEQ. At least I am not aware of their subsequent release or implementation.

The Final Report contains the following:

A. A description of the Task Force and its purpose

B. A brief summary of the Task Force's inventory of environmental monitoring activities that are conducted or supported by Federal agencies.

C. A listing of 38 issues and concerns identified in previous studies of federal environmental monitoring programs.

D. A discussion of major problem areas

1. Technical and program coordination
2. Quality assurance
3. Multidisciplinary and cross-media analysis
4. The budget process
5. Socioeconomic data issues
6. Natural resources and land use data issues
7. Global monitoring
8. Ecological monitoring

E. Specific recommendations for improvement

1. A National Environmental Statistics Program
2. A National Ecological Program
3. Improved land use and resources data coordination
4. Strengthened water data coordination
5. Improved cooperation with international organizations
6. An interagency users group for integrated health and environmental data
7. Coordination of precipitation chemistry studies
8. Improved quality assurance practices

9. An integrated federal environmental data system
10. Mechanisms for feedback from non-federal data users
11. An ecological data exchange
12. A long-term ecological measurements program
13. Better support for interagency coordination efforts in the budget process

HISTORY AND OPERATIONS OF THE TASK FORCE

As you know, the Task Force was by no means the first to address the shortcomings in the environmental data and monitoring programs supported by the federal government. In fact, the Task Force was convened largely in response to previous critical evaluations by the National Academy of Sciences, the General Accounting Office, the Congressional Research Service, and at least two congressional committees, including the predecessor to this Subcommittee, then chaired by Mr. Brown.

The Task Force was convened by CEQ Chairman Charles Warren in September, 1977. Nineteen federal agencies participated:

- Council on Environmental Quality
- Council of Economic Advisors
- Department of Agriculture
- Department of Commerce
- Department of Defense
- Department of Energy
- Department of Health, Education, and Welfare
- Department of Housing and Urban Development
- Department of the Interior
- Department of Labor
- Department of Justice
- Department of State
- Department of Transportation
- Department of the Treasury
- Environmental Protection Agency
- National Aeronautic and Space Administration
- National Science Foundation
- Nuclear Regulatory Commission
- Water Resources Council

The Task Force turned out to be a rather refreshing forum for informed soul-searching by senior officials of the participating agencies, who generally managed to look beyond the specific missions, needs, and interests of their individual programs. I believe that the Task Force produced some sound recommendations that were responsive to many of the past criticisms -- recommendations that career staff of the participating agencies seemed ready and willing to embrace. Unfortunately, most of those recommendations since appear to have become side-tracked by the cyclical nature of the Executive Branch of the government. It seems that most of the recommendations were lost in the outgoing shuffle of the previous Administration, and not actively pursued by the present Administration.

The work of the Task Force was performed mainly by senior staff and managers from the participating line agencies, with CEQ acting in its traditional role of collegial gadfly and facilitator. At the beginning, the Task Force seemed cautiously optimistic about achieving some program improvements. The participants generally did not deny or attempt to rationalize the technical and program deficiencies that outside reviews had identified over and over again. Many could have turned, with some justification, to excusing program deficiencies on the basis of statutory limitations, budget constraints, competing priorities, and other historical or technical realities. Once the Task Force participants got started, though, they showed a definite lack of defensiveness and a desire to make sensible changes. After all, this was a real opportunity for self-correction by the troops in the trenches. The new Carter

Administration in 1977 had a fresh mandate and sought improvements. The Congress, especially Chairman Brown, expressed a very supportive attitude and a desire to help. The President's Reorganization Project, which you will recall had a high priority at the time, indicated that they viewed the Task Force as an excellent mechanism for information and change.

The first order of business, largely at the encouragement of OMB and the President's Reorganization Project, was to tackle the job of sorting out and documenting what the Task Force sought to analyze -- the environmental monitoring and related data programs supported by the federal government, together with their specific responsibilities and resources. This was a difficult undertaking, because a great deal of federal monitoring is rather obscurely mixed with other activities in the agencies' budgets, and any analysis is highly sensitive to semantics.

The survey resulted in extensive documentation which was summarized briefly in the Task Force's Final Report. Based on Fiscal 1978, the Task Force identified more than 150 specific federal environmental monitoring programs with budgets totalling approximately $730 million, not counting the undeterminable numbers of programs and resources that were closely mixed with other associated activities and impossible to isolate for analysis. Although I moved to EPA soon after the survey was completed and was unable to remain active with the Task Force, I have been told that the survey proved to be useful as a source of data in the subsequent work.

Former Task Force participants have informed me that by the time they were ready to begin writing the Final Report in 1979, the nation's economic and political conditions seem to have caused outside support for the Task Force to diminish quite a bit. I am told that at some point, a constraint was imposed on the Task Force to limit its recommendations to actions requiring no new legislative or budget initiatives, although I am not able to document that instruction or its source.

In spite of that lessening of support, the Task Force chose to continue its efforts, relying mostly on mechanisms such as interagency agreements and executive orders in their recommendations.

FINDINGS AND RECOMMENDATIONS OF THE TASK FORCE

Technical and program coordination was the principal problem area identified by the Task Force. Seven of its 13 final recommendations addressed inter-program or inter-agency coordination. I speculate that many members of the Task Force would have preferred not to judge coordination as the major problem area because it often transcends the specific program perspectives with which they are accustomed to dealing, and also simply because it sounds like a fuzzy concept. Nevertheless, their discussions seemed to keep returning to the need for better coordination, and it is not difficult to appreciate why they did.

A typical government program is given a specifically defined statutory or administrative mandate, must operate with presently available technology and federal procedural requirements within a set budget, must satisfy a particular constituency, and must deal with other organizations in acceptable ways. A manager responsible for such a program may be hard-pressed to accomplish all of that, and the introduction of major new requirements or external criticisms may swamp the capability of an individual program to respond without substantial outside help.

For example, EPA's main water quality data system, STORET, originally was designed to serve as a large automated repository in which federal, state, and local users could each benefit from a national economy of scale in computerized data storage. The STORET program generally achieved that goal, but it mostly was storing other people's data. In recent years, STORET has been criticized for poor data quality, inadequate documentation of methods, lack of uniformity among its own data and with other data systems, inadequate sampling design, and inability to derive valid water quality summaries for the nation or its major watersheds. Those criticisms certainly reflect important needs, but it has been difficult for the STORET program to respond except as its mandate and budget have permitted. Many of the criticisms remain unsatisfied.

Many other federal environmental data and monitoring programs are in a similar situation, because their original scope and design did not forsee or attempt to meet national needs that transcend the specific goals which the individual programs were planned and budgeted to serve. On the other hand, those transcendant needs are real regardless of when they are recognized, and they are going to be heard over and over again until they are satisfied.

The Task Force's first recommendation in the coordination area was to establish a National Environmental Statistics Program, led by CEQ with interagency participation. Since its beginning, CEQ has held responsibilities under the National Environmental Policy Act of 1969 and the Environmental Quality Improvement Act of 1970 to report annually on the nation's environmental conditions and trends and to foster the generation of better information by all federal agencies. Some accomplishments can be identified, but CEQ has never really had the resources or authority to bring about anything approaching government-wide coordination. Without some sort of effective federal mechanism for inter-program coordination, studies such as the Global 2000 Report to the President (1980) and many reviewers will continue to find apalling gaps, inconsistencies, and redundancy among environment-related statistical programs of various agencies.

Today, the situation appears to be even worse than it was at the time of the Task Force's report. Budget reductions have devastated many statistical programs, some of which may be difficult or impossible to resurrect or even document properly. The main locus of interagency statistical coordination for many years, located at OMB and then in the Department of Commerce, has been dismantled. CEQ's statistical reporting program, which produced many of the data used in its annual reports and other studies, and was beginning to generate national reference documents like Environmental Statistics, 1978 and Environmental Trends (1981), appears to be terminated, undoing several years of hard work by many people within and outside government. The Conservation Foundation's State of the Environment (1982) report included an attempt to continue the dissemination of statistical information from some of the 400 key data series that CEQ and collaborating agencies had developed in its program, but funding limitations prevent them from continuing to shoulder the burden alone. Perhaps Dr. Terry Davies of the Conservation Foundation will comment on that when he testifies before you in June.

I brought a few copies of CEQ's last statistical and trends reports with me today, Mr. Chairman, in the hope that they might be useful to the Subcommittee, and because they seem to be rather hard to find these days.

Another Task Force recommendation in the coordination area was to create a National Ecological Program. I believe I have seen a similar proposal nearly every year since the old Federal Committee on Science and Technology proposed it jointly with CEQ eleven years ago. I recently came across a copy of the 1972 report in which they proposed it, and I shall be happy to provide it to the Subcommittee.

I must confess a special interest in that proposal, since my doctorate is in ecology. For the past two years, I have had the privilege of serving as the elected Chairman of the Ecological Society of America's 2400-member Applied Ecology Section. Although it is impossible to speak for all of our members, I believe most would agree that the fragmentation and lack of coordination among ecological programs in federal agencies is clearly an impediment both to good science and to good government. Ever since the enactment of the National Environmental Policy Act, every federal agency has managed to acquire at least a few token ecologists, but I doubt that anyone would call that an optimal program design.

Ecology today remains comparatively immature among the natural sciences, having attempted the transition from a purely descriptive to a predictive science only in recent years. Most ecologists are far from satisfied with the track record of our scientific discipline in meeting the practical information needs of society, and so are many public decisionmakers. We are striving to improve on that record. The focus, coherence, and enhanced information interchange that could be achieved by better federal coordination of its ecological programs would be of help toward that goal.

Regarding the Task Force's proposals for a long-term ecological measurements program and an ecological data exchange, I believe that the Long-Term Ecological Research (LTER) program of the National Science Foundation has been doing an excellent job of achieving much of what I think the Task Force had in mind. However, one area in which more action seems to be needed is the need for collection of some of the more routine time-series data that could support better analysis of certain regional and global trends, and could also help in validating predictive models, if properly coordinated with research activities at the LTER sites. This suggestion first arose in 1981 during a discussion with Dr. Eugene Likens, then President of the Ecological Society of America, in a workshop held at the EPA-funded Ecosystems Research Center at Cornell University. After some planning discussions between NSF and EPA research program officials who strongly supported the concept, EPA proposed an initiative of about $2.0 million in its Fiscal 1983 budget. The proposal would have provided modest supplemental funding at many selected LTER research sites for "baseline" characterization and monitoring of background trends in collaboration with the NSF grantees. The proposal was turned down by OMB.

The Task Force's proposals to improve interagency coordination of water, natural resources, land use, and international environmental data programs have not been implemented as far as I am aware. I know that in 1980, CEQ staff were actively preparing an executive order or similar instrument to address land use data coordination, but I have heard that the effort was discontinued. Perhaps some other initiative has taken its place. I also am aware that the Geological Survey's Office of Water Data Coordination continues to perform its valuable interagency liaison function pursuant to OMB Circular A-67, with added responsibilities inherited from the old Water Resources Council. I do not believe that the Task Force's proposal for enhancements has been pursued, however.

Regarding the problems with international environmental data, I would like to suggest that the Subcommittee review the Report of the Global 2000 Task Group on Data and Modelling Capability, dated November 7, 1980, as well as the testimony presented by Mr. Daniel B. Tunstall before the Subcommittee on Census and Population of the House Committee on Post Office and Civil Service on March 16, 1982. Mr. Tunstall's testimony also presents considerable information about the state of many U.S. statistical programs. I shall be happy to provide copies to your staff.

The Task Force's proposals dealing with multidisciplinary and cross-media analysis capabilities and the phased implementation of an integrated federal environmental data system arise mainly from two conflicting realities. First, most federal data programs are limited to specific boundaries, in ways and for reasons I discussed earlier. Many of these programs, even large ones, address only a single environmental medium or technical discipline such as air pollution measurements, soil types, or forest production. The conflicting reality is that many public policy and regulatory decisions require information that compares two or more such factors. Too often this means that the data can not be compared using a single data system, or even that they can not be analyzed meaningfully at all because of spatial, temporal, analytical, or other differences in the data collection by different programs. For example, when demographic data are based on political geographic units, whereas land use or drinking water data are structured on some other basis, a predictive model or risk analysis which tries to compare them directly may become inconclusive, invalid, or impossible to perform.

In 1975, CEQ attempted to overcome some of these problems through developing a computerized analysis system called UPGRADE, which it interfaced with carefully-selected data from many different federal systems. Although CEQ began that project to meet its own analytical needs, it received a surprising response from other organizations that had similar needs. The result was that for the next seven years, UPGRADE was used and co-sponsored by more than 20 federal and state agencies. The need for such a system apparently was so great that UPGRADE became a major program without having received any specific statutory mandate (except for some supportive appropriations language from Senator Proxmire in the third year of the project).

Although UPGRADE may have been a new concept in 1975, rapid advances in the state of computer systems technology had rendered it somewhat outdated by 1981, and the program was discontinued. Today, several similar systems created both inside and outside the government have taken its place, but the development and use of these systems continues to be rather piecemeal, and many federal data sources still do not plan for the accommodation of multidisciplinary analyses that transcend their own program responsibilities, even when they are the only data source for their area.

These days, some of the best ideas for coordinating environmental data systems seem to be arising from a completely unofficial and informal association of professionals called the Integrated Data Users Workshop, which was formed in 1980 without any formal mandate or federal support, largely by former users of CEQ's UPGRADE system. Their most recent meeting, held in October, 1982, attracted about 150 data program professionals from federal, state, and private organizations. I shall be happy to provide a copy of those proceedings to the Subcommittee, because I believe that the goals of that group -- better analyses, better use of new technologies, improved cost efficiency in data programs, etc. -- are very relevant to the Task Force's proposals and the interests of this

Subcommittee.

I assume that your next witness, Dr. Courtney Riordan of EPA, is going to cover the topics of quality assurance and precipitation chemistry in some depth, so I shall defer on the Task Force's proposals in those areas. However, I should mention that improved quality assurance may actually be the area in which federal agencies have responded best to concerns discussed by the Task Force. EPA, for example, began a major effort to respond even before the Task Force's report was completed. I am certain that Courtney will bring you up to date on that. Dr. Richard Dowd of ERT also may address it, because he personally performed a key role in EPA's initial steps in that response, when he served with the Agency.

Your previous witness, my old friend Walter Lyon, has spoken eloquently on behalf of state and local viewpoints in environmental monitoring for more years than I have been in the profession. He has done a much better job of representing that perspective than I ever could in attempting to discuss the Task Force's somewhat ambiguous recommendation about the need for better feedback from state and local agencies. However, I would like to echo his observation that in spite of the need for fiscal austerity in the federal budget, it is clear that the federal government can not continue to turn ever-increasing responsibilities over to the states while reducing their funds and technical support more and more each year. Whatever it is that "flows downhill" does not seem to be adequate help.

The final and perhaps the most important Task Force recommendation concerns what might be interpreted as a fundamental flaw in the budget process. On the one hand, better inter-program and inter-agency coordination obviously can produce great benefits in efficiency and cost-saving, as well as improved program performance. Moreover, both the expertise and the desire to correct monitoring program deficiencies already exist within the career staff of many programs. On the other hand, many programs have been punished, in effect, for past efforts to achieve those goals by their own initiative. This occurs whenever key, interdependent elements of a multi-agency program are funded through the separate budgets of the participating programs or agencies. When the agencies' proposed budgets are squeezed into the available resources, some of those key elements too often lose their funds, since the needs and value of the total interagency program may not be known to the decision makers. This leaves all of the cooperating programs with an unfillable gap. Thus, agency managers who are held responsible for program performance have become rather reluctant to depend upon outputs from other programs, so coordination suffers.

Regardless of whether such an adverse budget decision is made at higher levels of an agency, at OMB, or by the Congress, it is sometimes a case of the right hand not understanding what the left hand is doing. The Task Force proposed better mechanisms for identifying scattered key elements of interagency programs at the time those budget decisions are being made. I am unaware of any follow-up to that proposal.

In conclusion, Mr. Chairman, I would like to recall a comment that was made from the audience during the last annual meeting of the Integrated Data Users Workshop, which I mentioned earlier. After a great deal of rather depressing discussion of the adverse impacts of recent federal budget cuts and policies on many of the programs represented there, one participant observed that the worst times are often the best times to be planning for better times. After all, the comment went on, the nation's economic recession certainly was not going to last forever, and the consistent public support for environmental protection, as seen in opinion polls, should indicate that the pendulum of public policy will swing back sooner or later.

During the past decade, the federal government has learned many lessons about how to design and conduct environmental data and monitoring programs, and how not to conduct them. Today, information technology and other technical tools such as personal dosimetry and remote sensing are advancing so rapidly that yesterday's impossible is today's possible and tomorrow's inexpensively possible. Given these conditions, perhaps the best thing that the federal government can do is to acknowledge that many of its past programs were imperfect, interpret many of the recent budget cuts as a severe "pruning", and begin planning to take full advantage of past experience and new technology to do a better job this time around as it rebuilds the nation's environmental data and monitoring programs.

The opportunity for such action may be here soon, since we are all hearing reports that the nation's economic recovery is underway, and EPA has its "new beginning".

I believe that the Interagency Task Force on Environmental Data and Monitoring provided a useful forum in which federal program officials shared information, examined the problems jointly, and explored mechanisms for improvement. At a minimum, the Task Force's recommendations can help indicate to the Congress and others what kinds of improvements are thought to be needed and feasible by senior staff inside the line agencies.

However, I would also suggest that notwithstanding the program knowledge and practical experience of agency personnel, the Task Force experience also may have taught us that the goal of building an adequate national environmental monitoring system is beyond the capacity of the Executive Branch by itself. Informed oversight and new legislation from the Congress may be needed to assure the necessary widening of perspectives and the continuity of effort that the Executive Branch often finds difficult to muster and sustain.

Now that I am out of the government, these factors seem to be even more important than additional resources.

That concludes my prepared statement, Mr. Chairman. I would be happy to respond to any questions that you or other members of the Subcommittee might have.

Thank you.

REPORT OF THE GLOBAL 2000
TASK GROUP ON DATA AND MODELING CAPABILITY

for the

President's Task Force on Global Resources and Environment

November 7, 1980

Participating Departments and Agencies:

- Council on Environmental Quality
- Environmental Protection Agency
- Office of Management and Budget
- Department of State
- Department of Commerce
- Department of Agriculture
- Department of the Interior
- Department of Defense
- Department of Energy
- Department of Transportation
- Central Intelligence Agency
- National Science Foundation
- National Aeronautics and Space Administration

REPORT OF THE GLOBAL 2000 TASK GROUP ON DATA AND MODELING CAPABILITY

0. ABSTRACT

A Task Group on Data and Modeling Capability has evaluated how to improve the Federal capability to gather, analyze, and assess information about global population, resources, and environment issues. They sought to suggest the means to (1) improve data, (2) improve models (3) establish cross-cutting model linkages, and (4) make it work.

Eight sets of recommendations were developed: (1) establish an Office of Global Forecasting and Analysis to identify problems and priorities and be the center of coordinative actions; (2) name lead and(or) coordinating agencies with primacy in various subject areas on which data are collected, with coordinative and planning mechanisms within and among subject areas; (3) maintain data sets in collecting or using agencies, with indexes, procedures for access and exchange, and a central office for small subsets of data from the several subject areas; (4) improve technology for data collection and reduction, with emphasis on techniques for processing remotely sensed data; (5) improve international cooperation in data collection, assembly, processing, and interpretation; (6) establish mechanisms for coordinating the modeling efforts of U.S. agencies, and particularly establish means of linking models from various agencies and subject areas; (7) support development of cross-cutting global models; and (8) establish means of involving international organizations and other countries in development and use of models.

1. INTRODUCTION

1.1. Deficiencies of the Global 2000 Study

A wide variety of projection techniques or "models" were used in preparing the analyses that were the basis of the Global 2000 Report. The models varied greatly in their complexity. Most of the models were documented in detail, but others, such as those used for projections of climate, were "black boxes."

Authors of the Global 2000 Report and critics and reviewers have identified a multitude of faults in each model. Details of those faults are not repeated here. A cross-cutting criticism of the models, however, had to do with the lack of "feedback" and "linkages." Each of the models for a subject area (e.g., population, climate, food) generally is independent of the models for the other areas -- there is no "linkage." Another criticism of the models is they are not well suited to running multiple scenarios -- that is, to answer what-if questions.

Closely related to the issues of modeling are those of data -- the measurements that provide the basis for the models' projections. The Global 2000 project staff relied entirely on available data. They collected none of their own, and they didn't have the time or resources to dig out data from obscure reports or repositories. Some data were considered excellent (e.g., population, climatic, and economic data for the developed countries). Other data were quite poor, such as data on water supply and water use, for most of the globe.

There also was the problem of tying the data to the models and vice-versa. Time series of many data weren't optimal to modeling needs. Measurements were not uniform over space or time. Quality assurance, and hence validity, was often an unknown factor.

1.2. Purpose and Scope of this Report

Based on this knowledge of the problems that the Global 2000 Report identified with data and modeling, the Task Group on Data and Modeling Capability set out to analyze the problems and to recommend some general actions that might be taken.

The objective identified for the task was to develop justified recommendations for improving the Federal capability to gather, analyze, and assess information about global population, resources, and environment issues. This boils down to providing recommendations to:

1. Improve data,
2. Improve models,
3. Establish cross-cutting model linkages, and
4. Make it work.

The Task Group did not have the time or staff to carry out detailed analyses of individual models, data programs, and data systems. It concentrated more on dealing with the mechanisms -- the issues of who, how, and why, and the organizational issues.

Recommendations are summarized in the following sections. More detailed backup information on the issues and options is in the files of the Task Group leaders.

2. DEFINING PROBLEMS AND PRIORITIES

From the standpoint of the Task Group on Data and Modeling Capability, the Global 2000 Report highlights three fundamental problems. First, there are a number of extremely serious global problems relating to population, income, natural resources, and the environment. Second, policies designed to remedy global problems require long lead times. And third, the development of appropriate policies to address global problems requires significant improvements in identifying global problems and in devising appropriate analytical capabilities for assessing long-term global trends.

2.1. Deficiencies

The Global 2000 Report assembled "state-of-the-art" information on long-range trends. As a result of this effort, major deficiencies were noted. Among these were:

1. Where models existed, they were, in general, undocumented.
2. In some cases, no models were available, data were scant, and the projections were based on the "best guesses" of individual analysts.
3. The data used in many models were unvalidated.
4. Many models lacked the ability to test different policy assumptions.
5. The absence of appropriate linkages and feedbacks both within and between different sectoral models produced inconsistent and unrealistic results and severely constrained the projection and analysis of long-range trends.

All of this can be summarized in the words of the Global 2000 Report:

> "...collectively the Executive agencies of the government are currently incapable of presenting the President a set of mutually consistent projections of world trends...." (Global 2000 Technical Report, p.5)

2.2. Issues, and Options, and Recommendations

It is not now possible to provide the President with consistent and reliable information on long-range global trends dealing with population, income, natural resources, and the environment. Sections 3 and 4 of this report make specific recommendations to correct the principal data and modeling deficiencies identified in the Global 2000 Report. This section focuses on a set of corrective measures designed to improve the government's ability to project and assess long-range global trends.

Improving the government's ability to project and assess long-range global trends will require strengthening the analytical capability of the Government. This includes increasing the ability to identify problems, improving existing models and developing new ones, and establishing responsive and valid data sets.

> Recommendation: The President should direct Federal agencies to correct the data and modeling deficiencies identified in the Global 2000 Report.

Correcting existing global data and forecasting deficiencies would improve the government's ability to address global problems. While this action is required, it begs the questions of coordinating and linking data, models, and analyses that now focus on narrow and specific sectors. A major objective must be to produce consistent forecasts necessary for policy making. The need for coordination is evident and, as the Global 2000 Report points out, past government efforts in this area have been generally unsuccessful.

Among the options, three are discussed here: (1) creating an ad hoc commission, (2) designating a lead agency; and (3) establishing a permanent office. The creation of an ad hoc commission to correct deficiencies identified in the Global 2000 Report and to undertake the preparation of another report is one option. Given adequate resources, staff, and leadership improvements could be expected. Lack of permanence and the inability to pursue corrective actions requiring substantial time and effort are major factors that indicate that this option will probably not produce major advances or promote the development of an adequate long-range global forecasting and analysis capability. The option of designating a lead agency holds the appeal of using existing machanisms to create, develop, and promote the desired capability. Problems with this option include the lack of an obvious choice for lead agency and strong evidence that this approach fails to secure the coordination required to accomplish the intended objective.

To the extent that it is important to strengthen the government's ability to forecast and assess long-range global trends, it seems clear that a focal point for the activity, which includes both the need to coordinate other agencies' activities as well as to conduct independent forecasts and analyses, must be established. In order to be useful for the policymaking activities of the President, it is important that such an activity be located in the Executive Office of the President. To assure maximum visibility and credibility, a global forecasting and analysis activity should not be attached to an existing EOP office.

Recommendation: The President should establish within the Executive Office an Office of Global Forecasting and Analysis. The functions of this Office should, at a minimum, include the following:

a. identify long-range problems of global significance;

b. promote the development of appropriate analytical tools and data required to assess long-term implications of global problems;

c. coordinate global modeling and data activities within the Federal Government;

d. prepare a comprehensive report on long-term global problems to be delivered to the President not later than January 1983, which will be updated not less than every five years;

e. prepare an annual report that provides a detailed assessment of a major global problem and a comprehensive analysis of policies designed to address that problem;

f. prepare an annual report that assesses the state of global modeling, data collection, and analyses activities in the Federal Government and make recommendations for improvements;

g. establish and support a non-governmental center designed to enhance global problem identification, modeling and analysis; and

h. establish and support a non-governmental center designed to provide a forum for testing global forecasting and analysis capabilities.

2.3. Resources

Minimum successful operation of an Office of Global Forecasting and Analysis will require 15 professionals and an annual budget of $3,000,000.

3. ISSUES ON DATA

As discussed in the introduction to this paper, the Global 2000 staff experienced a problem that is common among modelers and analysts. They could not, in many cases, locate good data that could be interpreted or used as input to projection models.

The Task Group analyzed the problems of inadequate data, and the following discussion considers the issue from four different positions: the roles of agencies and their coordination, developing base sets of data for use in analyses, improving technology for data collection, and dealing with international organizations.

3.1. Agency Primacy and Coordination

3.1.1. Deficiencies

Data on population, resources, and the environment are collected by many different U.S. agencies, by foreign countries, and by international organizations, often in cooperation with foreign governments. Most of the data are held in agency files and data banks. There they are hard to identify and hard to use. Furthermore, many of the data were collected to fill specialized needs and, therefore, they have limited utility for interdisciplinary or other uses, such as use in global modeling.

3.1.2. Issues and Options

Some of the options that were considered for the nation's data programs were:

(1) Status quo. Accept the present programs of data collection as adequate or at least as the best program that can be put together within practical considerations and resource constraints. Although present programs are inadequate in many respects, they do provide data which can be used with limited capability. To disturb the status quo would require new efforts and initiatives.

(2) Centralize data collection. Combine responsibilities for data collection and maintenance in one or a few agencies (e.g., Census and NOAA). A few super data-collection agencies could provide better organization, efficiency, and quality assurance. On the other hand, such an action would require a major Federal reorganization, and in many cases would produce an

undesirable separation of data collectors from data users.

(3) Subject area primacy. Name lead and(or) coordinating agencies responsible for each population, resource, and environmental subject area. The lead agency for each subject area would be one with a major program to collect data for that subject, or it may be a major user of data. The lead agency would make the basic decisions on what data to collect, who would do the collecting, and what methodology would be used. This would solve many of the planning and coordination problems without disturbing established governmental programs. Coordination, however, requires "clout" in the lead and(or) coordinating offices in order to be effective.

(4) Cross disciplinary coordination. Provide a mechanism for coordination among the subject area so that data could be used for cross disciplinary modeling and analyses. This would solve problems of non-compatible data for modeling and analyses. Such coordination, however, has been proved hard to achieve. It requires skilled coordination, and in some cases, requires "clout" in the coordinating unit.

3.1.3. Recommendations

The following recommendations combine options (3) and (4). They were chosen because they are likely to achieve results rather rapidly, and would be most workable within the governmental structure. Specific steps are:

1) The President should order that the Office of Global Forecasting and Analysis, in consultation with the Office of Management and Budget (OMB), name lead and(or) coordinating agencies and principal assisting agencies for the collection of various types of data on population, resources, and the environment;

2) Lead and(or) coordinating agencies should be empowered through orders similar to present OMB circulars, such as Circular A-62 for climatological data and Circular A-67 for water data;

3) Lead and(or) coordinating agencies so named shall be responsible for developing plans to collect necessary data for planning and analyses, including domestic data collection, as well as technical and administrative coordination with appropriate international organizations and(or) equivalent organizations of other countries;

4) Lead and(or) coordinating agencies shall establish a plan or conceptual framework for data collection for each data subject area considering the needs for data and the functions and levels of each type of data program; and

5) The President should order that the Office of Global Forecasting and Analysis, in consultation with OMB, the Office of Federal Statistical Policy and Standards, and Comptroller General of the United States, and any official or ad hoc groups that are established to coordinate modeling, shall establish procedures for:

   (a) Cross disciplinary coordination of data programs (e.g., data on climate and pollution levels); and

(b) Cross-cutting review of how well data collection satisfies needs for information for policy analyses.

3.1.4. Resources

See Section 2 for resources in the Office of Global Forecasting and Analysis. In addition, a planning and coordinating staff of about five persons will be required in each lead agency.

Analyses of the Interagency Task Force in Environmental Data and Monitoring (CEQ report, March 21, 1980) found that there is considerable inefficiency in programs for data collection. Improved coordination actually could provide more and better data at no additional cost to the government.

3.2. Base Sets of Data

3.2.1. Deficiencies

Data on population, resources, and the environment usually are filed or stored in computerized data sets in the agencies or organizations that collect the data. In many cases users from outside the organization find that the data are hard to get, that getting the data often takes a long time and is expensive, that the details of the data are not documented, that quality assurance is unknown, that data from one data base cannot be used easily with data from another data base, and that manipulating and analyzing the data requires reformatting and trained computer experts.

3.2.2. Issues and Options

Some of the options that were considered for solution of the major problems associated with data sets were:

(1) Data center for all data. Establish a massive data center and require that all government data be stored in that center. Staff the center and index and document the data. Provide library-type assistance for data users. Such a system would be expensive and is highly undesirable because it would separate the data from the primary users in the agencies or organizations that collect the data. It also would require considerable time to establish.

(2) Index data. Establish a means for indexing the data stored in individual agencies. This option is attractive because a considerable amount of inventory and indexing work is underway (e.g., for water data). OMB now is in the final stages of preparing a circular dealing with inventory of data. The National Technical Information Service would be designated as the center under OMB's plan.

(3) Develop procedures for access and exchange. A central index would keep track of who has what types of data. Conventions for exchange could be developed through a consortium whereby there would be established routes of contact among data holders, and methods for sharing data and supplying the data to users. Current systems in the Geological Survey and the National Oceanic and Atmospheric Administration already provide limited services of this type with considerable success.

(4) Develop standardized data formats and coding. Standardized formats and coding and standardized documentation and quality assurance coding would provide a means of providing data in a format that is easily useable and would provide documentation to help users evaluate the precision and accuracy of the data. Such standardization is greatly needed and can be established with relatively small effort and disruption of programs.

(5) Establish computerized data networks. This option is not considered practical at the present state of the art. In 5 to 10 years it may be a very practical option.

3.2.3. Recommendations

It is recommended that the President order the establishment of an integrated system for storing, processing, and using data on population, resources, and the environment, with the following features:

(1) Existing data systems should be maintained by the organizations that established them, need them most, and use them most, or be merged with others as determined by the agencies to be most practical.

(2) A central office, such as the Office of Statistical Policy and Standards, National Technical Information Service, the Library of Congress, or a private or international organization should assemble information on the location of types of data needed for global analyses.

(3) A central office in consultation with groups of modelers should establish standards for data, develop standards for data exchange and data security, serve as a central point to which users of data may direct requests, and fill requests for data by computer access to existing data files or refer the request to an appropriate organization.

(4) A central office should work toward creation of a central storage and analysis facility to serve needs of frequent users. Only a subset of data would be stored in the central system, and the same system would have selected models and analytical programs. The data subset also would meet data needs for the selected models. The central office also would develop regular procedures for updating and correcting data, in cooperation with the originating agencies

3.2.4. Resources

A program for indexing and exchange of data is estimated to require a total of about 30 positions (about 1/3 in the central office and about 2/3 spread throughout the lead agencies) and about $2-4 million dollars in computer and contractor support. Based on CEQ's experience with UPGRADE, the operation of a central storage and analysis facility would require less than 5 positions and a contract and computer budget of less than $1.5 million.

3.3. Improved Technology

3.3.1. Deficiencies

Many types of population, resource, and environmental data are difficult and expensive to collect and require trained and experienced technicians. Most developed countries have the skilled staffs and the budgets for data collection, but the lesser developed countries lack the skills and financial resources. Nevertheless, the data from the lesser developed countries are essential for global forecasting and analyses. As a consequence, studies such as the *Global 2000 Report* often find that they have to make do with inferior data for critical parts of their analyses.

3.3.2. Issues and Options

Some of the options for dealing with the problem of inadequate technology for data collection are:

(1) *Status quo*. Each nation continues to collect data to meet its own needs. A few loosely organized international organizations (e.g., UNEP, WHO, FAO, OECD) continue additional help and guidance through standardized "networks." In addition, the Agency for International Development and a few other U.S. and international organizations provide assistance and training.

(2) *Improved Coordination*. Work to improve the existing data-collection programs by increasing coordination efforts in international organizations.

(3) *Support data collection*. The United States could increase direct financial support and technical staff in items (1) and (2) so that the countries would be aided in collecting data. In addition, the United States could establish "international monitoring teams" to collect data where it is not practical or possible to develop local capability.

(4) *Technology fix*. Put substantial support into schemes such as remote sensing and international teams to make them capable of collecting data with minimum support of governments. In many cases, this type of fix could be expected to provide data of higher quality than could be achieved through the other three options, or is now achieved even in the developed countries. In addition, the technology could improve data collection in the developed countries.

3.3.3. Recommendations

Depending on the particular needs and circumstances, all four of the options listed in section 3.3.2 may be applied to data needs.

The status quo, option (1), is meeting many present data needs. It is highly desirable, however, to increase efforts for data collection in several areas where there are clearly defined needs for the data; that is, where it is clearly understood why the data are needed and how they will be used.

In addition, with needs for the data clearly defined by the Office of Global Forecasting and Analysis and the lead agencies, it is highly desirable to have selective application of the technology fix, option (4), and especially to have technology for better use of remotely sensed data. There are large amounts of remotely sensed data being collected which have potential for application, but the technology for processing the data and interpreting them is not adequate or is extremely expensive.

Therefore, within carefully defined guidance and objectives, the following steps are recommended:

1) The President should direct that the Office of Global Forecasting and Analysis and each lead and(or) coordinating agency named under the recommendation in Section 3.1.3, in consultation with agency modelers, shall, in the review of data collection programs for each subject area, assess areas where technology of remote sensing may be applied to data collection and interpretation, considering the needs of data for global modeling and goals and needs for both the developed and lesser developed countries. Emphasis shall be placed on reduction and interpretation of data rather than on space or sensor technology for collecting data.

2) The Office of Global Forecasting and Analysis, in consultation with the National Science Foundation, the Office of Management and Budget, the National Aeronautics and Space Administration, the Office of Statistical Policy and Standards, the Comptroller General, the International Development Cooperation Administration, and each lead and(or) coordinating agency, should develop and implement a strategy for developing cheaper, more effective means for applying the technology of remote sensing to collecting data on population, resources, and the environment, especially for developing countries.

3.3.4. Resources

The resouces to be applied should be evaluated annually by the Office of Global Forecasting and Analysis in consultation with lead agencies, OSTP, NSF, and NASA. For planning purposes only, consider an estimated cost of $0.5 - 1.5 million.

3.4. International Cooperation to Improve Data

3.4.1. Deficiencies

Multinational organizations such as FAO, UNESCO, WHO, UNFPA, the World Bank, and the other development banks play an important role in collecting and standardizing international data. The U.S., other OECD nations, and the multinational agencies also provide important assistance to developing countries in the collection, storage, retrieval, and use of economic, natural resource, and environmental data. Cooperation with other OECD nations is also useful for improving the data. The quality of data available to the United States and the ability of other nations to cooperate with us in analysis and policy depend on these efforts. However much still needs to be done to improve data world-wide.

3.4.2. Issues and Options

(1) Status quo. Cooperate with the international organizations as opportunity permits, and as U.S. data collectors judge suitable.

(2) Improve cooperation. Direct U.S. organizations involved with use and collection of data to cooperate and coordinate with international organizations and establish a review process to see that they do it. This could be done with minimum cost (see Section 3.4.4. for discussion).

(3) Increased support and cooperation. In addition to option (2), budget sizeable increases of U.S. financial support for international organizations and developing countries. In the end, this option would achieve highly desirable results, but it would be slow to succeed in many cases.

3.4.3. Recommendations

Option (2), for improved cooperation, generally is recommended. The U.S. programs for assembly, collection, and processing of data should be coordinated to the fullest extent possible with programs of international organizations through the following steps.

(1) The President should order that all agencies named as lead and(or) coordinating agencies under the recommendation in Section 3.1.3 shall, to the maximum extent possible, coordinate their work with other governments and international organizations. This should include programs to share data and technology with the organizations and with other countries.

(2) The President should order that the Office of Global Forecasting and Analysis, in cooperation with OMB, shall review coordination with foreign countries and international organizations to assure that cooperation and coordination are effected.

3.4.4. Resources

Costs would be small, but would be in a budget object class that has been under extremely tight control -- travel, especially foreign travel. Estimated cost might be less than five positions. Travel cost would be high and would need OMB agreement and approval.

4. ISSUES ON MODELING

4.1. Coordination and Policy

4.1.1. Deficiencies

One reason for the poor quality of long-term global projections by government agencies is the lack of "an adequate consideration of interrelationships and feedbacks involved in a world system" among modeling efforts (Global 2000, p. 3). Improvements in this area require better coordination and linkage between agency models. Related to this problem is the absence of standards for model development and use.

Despite the widespread recognition of problems in policy modeling, there has been little action taken in response to them. In part this is because policy modeling is new and its technology is changing rapidly.

4.1.2. Issues and Options

The following actions would improve the government's long-range global modeling efforts. These are functions that should be performed by a newly established Office.

- Establish a clearinghouse to provide information on models and groups developing and operating models,
- Develop model code documentation standards,
- Establish data exchange standards necessary to link model runs,
- Promote multiple access to models,
- Establish mechanisms for third-party model assessment and validation, and
- Review agency modeling plans and budgets dealing with long-term modeling.

An example of a long-term modeling clearinghouse is the "Clearinghouse on the Future," maintained by the Congressional Research Service in the Library of Congress. This contains a large catalog of projections and previsions about the future. Any office established to coordinate global modeling policy should collect descriptions of modeling activities and make them available.

Model documentation standards in government have been most vigorously pursued by the military services. These and other standards have been examined and proposed for the whole government by the General Accounting Office. GAO, though, can only suggest documentation standards for the Government. Several large modeling projects have adopted documentation standards of their own. For example, the Energy Information Administration has initiated a documentation effort as a result of a Congressional requirement to make its PIES model "accessible." To do this, they have enlisted the aid of several academic institutions and the National Bureau of Standards. The National Science Foundation has also supported model evaluation studies. (See David Wood, Validation and Assessment Issues of Energy Models. NBS-SP-569, Feb. 1980.)

A demand for model documentation can best be created by having models developed for the same problems presented for comparison to a forum of modelers. Supporting small technical groups to invite modelers to present their models competitively is a successful way of stimulating model documentation and ventilation. The Electric Power Research Institute and Stanford University are good examples of modeling forums.

Technical solutions to linking models have been tried in the military, at the Electric Power Research Institute and at some universities. These are experimental and often require much sophistication to operate the large systems that they produce. However, placing several models together within a self-consistent system on one computer is the only way to produce a more comprehensive, linked model and leave the agencies in control of their models.

Access to projection models is typically provided as a "value added" component to computer services. The Data Resources Incorporated (DRI) economic forecasting model works this way. This requires extensive suppport by the modelers. Two examples of user-interactive computer systems in the Government, which are integrated data systems, are the Domestic Information Display System and the Council on Environmental Quality's UPGRADE system. There are no examples of "accessible" systems as large as the large models called for in the Global 2000 Report. Accessiblity would be aided by designating one facility to provide it, since this would guarantee uniform access.

Model assessment and validation are detailed studies carried out by a third party for the model user. Models are only tools to inform policy makers, and do not provide unqualified answers. Validation is an effort to improve the use of models. Assessment and validation policies and procedures make up a good part of present discussions of government modeling activities. (See, for example, the series of conferences the National Bureau of Standards has held on modeling policy.)

Unlike modeling policy, the Federal government has an office with responsibilities for statistical policy. The U.S. statistical system is one of highly decentralized offices coordinated by a small statistical policy office. Currently, this role is performed by the Office of Federal Statistical Policy and Standards (OFSPS) in the Department of Commerce. OFSPS's activities consists of annual reviews of the budget documents of statistics users and producers from which recommendations are made to the Office of Management and Budget. Also, OFSPS runs a series of ad hoc statistical coordinating committees to plan data development in different fields. The OFSPS activities have recently been reviewed by the Bonnen Report. (See "Improving the Federal Statistical System," Statistical Reporter, May 1980, U.S.GPO, p. 197.)

4.1.3. Recommendations

The Office of Global Forecasting and Analysis should: 1) publish inventories of facilities, activities and projects related to global problem modeling, 2) develop and promote standards for model documentation and for various means of linking models, 3) validate and assess models, 4) support facilities to provide access and integration of models, and 5) stimulate modeling forum activities. Since modeling and data collection are expensive activities, the Office should have some power over resources if only to advise on their allocation.

The experimental nature of modeling implies other conditions about this recommendation. Setting standards that are too strict in modeling could stifle a quickly developing field. This is the major concern of modelers who argue against centralizing or standardizing modeling activities. Agency modelers believe strongly that agencies must remain in control of the models.

4.2. Global Modeling in Government

4.2.1. Issues and Options

A major need illustrated in the Global 2000 Report was to bring existing pieces of "the government global model" into closer linkage. This section approaches the problem from the other end: to support global modeling experiments, and applications. It may be better to let a thousand flowers bloom than undertake one comprehensive effort to develop one government global model.

As the Global 2000 Report pointed out, there is little global modeling done in government. There is also no point in the government that focuses the demand for the forecasting and analysis of specific global problems or the results of global studies. These conditions suggest several options:

1) Assemble a global modeling group in the government to bring together those funding global modeling and those interested in the results.

2) Have interested parties within and outside government meet to set a global modeling priority list as a problem identification exercise. This may be combined with an annual global problem conference to give visibility to the dissemination of global analyses.

3) Direct an office to fund global studies. This may be thought of as an extension of a directive to undertake a Global 2000 update.

4) Initiate legislation to set up an independent institute that would have leadership in futures research. A very similar proposal has already been made by a House Committee. (See A National Energy Policy Act, Hearings on H.R. 11678 and H.R. 12055, April 1978.)

Any of these options would greatly improve the government's role in support of global modeling. Present support is intermittent and does not generally address global concerns. In addition, these activities would improve the quantity and quality of modelers. Some attention should be devoted to assessing the manpower needs in the areas of modeling and analysis.

The National Science Foundation does not have an office that funds globally integrated models. NSF sees its role to fund basic research and research applied to identified needs. In related fields, NSF does support systems theory projects, some econometric modeling, and is a sponsor of the International Institute for Applied Systems Analysis (IIASA) program. However, these are scattered throughout the Foundation.

There is a small amount of funding for global models in other parts of government. The policy office of the Joint Chiefs of Staff uses the WIM model in preparing their long-range strategy document. The Office of Research and

Development in the Environmental Protection Agency and Bureau of Oceans and International Environmental Science Affairs in the Department of State are both considering funding dynamic systems global models. The Research and Special Programs Administration of the Department of Transportation has operated an ad hoc group in systems modeling. This group has not looked at global modeling per se, but does serve as an example of model funders assembling to compare their activities. The same occurs to a limited extent in professional society meetings outside the government. Both the American Institute of Electrical and Electronic Engineers and the Operations Research Society of America have sections on large-scale models.

Formal problem identification activities, while not modeling, are often a prelude to it. Modeling must begin with specification of a problem to be solved, to which problem identification can contribute. Also, comparing a list of emerging problems with the technical changes considered in a model is a method to "anticipate" technical change -- one of the outstanding problems with models. NSF's Office of Problem Assessment carries out problem identification activities for their applied research programs. The Office of Technology Assessment ran a large project to generate a priority list. The President's Office of Science and Technology Policy has a mandate for strategic planning from the Congress to identify emerging issues and suggesting priorities. OSTP has recently been criticized by the General Accounting Office for not carrying out the mandate (See GAO, OSTP: Adaptation to President's Operating Style May Conflict with Congressionally Mandated Assignments, PAD-80-79, Sept. 3, 1980.)

4.2.2. Recommendations

The major focal point for stimulating the development of global models in the government should be the Office of Global Forecasting and Analysis. This office would interact with other government global modelers, bring together interested parties to identify global problems, and would have limited funds of its own to sponsor research and applications activities.

Since the office would be in the Executive Office of the President, no legislation would be necessary. These activities would bring the office into close interactions with major international activities and their U.S. counterparts.

4.3. International Response

4.3.1. Issues and Options

The need to study and respond to growth limits, resource depletion and environmental problems is shared among countries. It is important to encourage international organizations to carry out studies and respond to global problems.

International organizations, non-governmental organizations (NGOs) and foreign sponsored activities already exist in this area. In some cases, other countries may be ahead of the U.S. in international modeling ventures. Global modeling efforts are underway at the Science Policy Research Unit of the University of Sussex in England; in the field of science and technology by the OECD in Belgium; and by the Economic Council of Canada. The UN has several permanent activities along these lines: UNEP, which has a broad mandate, yet few people and funds; FAO, which may serve as an example to UNEP; and the U.N. Statistical Office, which coordinates international data compilations. The list of foreign and international activities has not been compiled and is probably much longer.

United States participation in international organizations that encourage the exchange of information and data used by Global 2000 has been examined by the Bureau of International Organizations in the Department of State as part of the preparation for the UNCSTD conference last summer. A State Department group has suggested 17 UN activities which could be funded at higher levels, or which could be augmented with the cooperation of U.S. organizations. The Department of State also supports to a proposal, for a UN information network. The system would be a message transferral mechanism (a communications network) for technical information requests and responses.

Agencies besides the Department of State are working with NGO's and foreign researchers on global questions. NSF's funding of the International Institute for Applied System Analysis (IIASA) is a notable example. IIASA is represented by academies of science in 12 industrial nations from both East and West. The goals of the Institute are, briefly, to promote international collaboration, to advance the sciences and to apply its findings to global problems among nations and universal problems of all nations. (See Global 2000 Technical Report, p. 707). As these goals imply, the purposes of the Institute are similar to those for which Global 2000 was undertaken. In the eight years the Institute has existed, the one hundred or so researchers it has supported have had a moderate degree of success. Primarily the Institute has developed close ties with academic and research institutes in Eastern bloc and free world countries.

United States support for IIASA is provided by NSF through the National Academy of Sciences. NSF's Directorate for Scientific, Technological and International Affairs (STIA) manages the funding and evaluates the progress of IIASA. NAS manages participation by academic institutions in IIASA and houses the U.S. Advisory Committee on IIASA.

NSF is in the process of evaluating its experience with IIASA, so current recommendations will not be available before December. However, a sense of how NSF has viewed IIASA is conveyed by a previous evaluation, summed up in a memorandum to the National Science Board on December 8, 1978. On the subject of application of IIASA work the memorandum said, "Access by IIASA to both potential users of IIASA work for policy applications in the U.S. and to policy-oriented advices from the U.S. is inadequate." Clearly, the recommendations that would follow this evaluation would also respond to Global 2000 conclusions. Perhaps, if U.S. government decision makers become more involved with IIASA projects and their results, there would be greater awareness and analysis of long-term global problems.

Options to increase international activity may be grouped as follows:

1) Encourage increased contribution to, and coordination with, existing international activities through established government channels,

for example, the Department of State.

2) Increase access to IIASA by broadening the representation on the NAS Advisory Committee to entities with policy interests, and encourage IIASA to disseminate results more widely in the U.S., perhaps by holding conferences here.

3) Request an international body to continue parts of the Global 2000 modeling and analysis by producing an updated study or conference, or setting up study centers to address global problems. IIASA, OECD, and the East-West Center are examples that should be examined.

4.3.2. Recommendations

The Office of Global Foresight and Analysis should begin activities to support and strengthen international global modeling activities. In considering the involvement of international organizations and other countries, two points must be kept in mind. First, it is probably unacceptable for the United States to take unilateral action to address Third World problems. Second, consolidating data from other nations and assuming the responsibility to make conclusions from them would not be credible to other nations. Third, Congress has been reluctant to fund initiatives in this area to help developing countries, as shown by the recent defeat of the proposed Institute for Scientific Technical Cooperation.

In addition, it is important to note that however complete international capability for analysis of global concerns is, it will not satisfy U.S. government agencies' need for responsive analysis. An international institute may serve as an example, but it is no substitute for the United States putting its own house in order.

Statement by Daniel B. Tunstall
Senior Associate, The Conservation Foundation

before the
Subcommittee on Census and Population
of the
House Committee on Post Office and Civil Service

March 16, 1982

Mr. Chairman and Members:

It is a pleasure for me to be here this morning to discuss some of the implications of budget reductions on environmental statistics. I want to thank the chairman and his staff for extending this invitation to me to participate in these hearings on federal statistics.

The changes in budget and in information policy over the past year, and the changes proposed for the coming fiscal year, will have substantial impacts on federal statistics. In fact, the impacts of these changes in the environmental areas, the field I represent, are already noticeable. Many of the changes in policies and programs are profound. They are now adversely affecting, and will continue to adversely affect, our awareness and understanding of environmental quality.

Last September I joined The Conservation Foundation, located here in Washington. The Conservation Foundation is a non-profit, research and communications organizations dedicated to improving the quality of the environment and promoting the wise use of the earth's resources.

Prior to this appointment, I worked as a consultant to the Council on Environmental Quality, Executive Office of the President, for more than five years. During that time I directed the research and development of the Council's latest publication, *Environmental Trends*. Our staff also prepared the first national book of environmental data tables, *Environmental Statistics, 1978*, and worked on various issues of *Environmental Quality*, the Council's annual report. We also worked with the Council to manage U.S. participation in the environmental data programs of a number of international organizations.

Before working for the Council, I spent five years at the Office of Management and Budget in the Statistical Policy Division. During those years, I directed the development of the first edition of *Social Indicators*.

My time in Washington has been spent as a user of federal statistics. My perspective is of one whose job it is to select, organize, and communicate statistical information to a general audience, the most important part of which are policymakers. I am particularly interested in the communication of statistical information in ways that are understandable and useful to the public.

I believe that the responsible communication of statistical information about the changing quality of life in the United States is an important and essential function of government. It is an expensive, time-consuming, and difficult function that must be maintained and continuously nourished given the complicated, highly technical, and rapidly changing society we have fashioned.

Environmental statistics, like all public-use statistics, is an evolving field. We are the new boys in the federal statistics community. There is no long tradition of environmental statistics for public use the way there is in demography, macroeconomics, employment, health, and many other areas of broad social concern. We have our indicators and indices, but the morning papers do not yet carry reports on the changing conditions of air, water, land, and wildlife in any coherent fashion.

Because our field is new, it is important that the government institutions that do the research, collect and process the data, conduct the analysis, and communicate the findings in published reports be maintained and strengthened. These institutions are not now being maintained. Some are being destroyed; others are being seriously eroded.

Before examining some of the environmental statistics programs that are being hurt by changes in policy and budget, let me mention one problem. There are very few statistics about environmental statistics. Statisticians like to count things and people and to monitor processes, but they don't measure what they themselves do very well. I therefore can't give you a set of meaningful figures for changes in environmental statistics personnel and budget over the past few years. The Special Analysis of the Federal Budget (not released this year with the Budget) provides some information on environmental statistics programs, but it is incomplete. Therefore, the information I am providing this morning is not comprehensive, nor systematic.

ENDANGERED REPORTS

From my perspective, one of the most serious changes in environmental information policy has been the decisions by the heads of environmental agencies to stop the development, publication, and distribution of a number of key reports. Four major reports are on the threatened and endangered list. They will probably soon become extinct. Each report covers many areas of environmental concern. They identify problems, organize useful and important information, and provide detailed assessments of conditions and trends. All four were intended to be periodical. Two were to be annual, the other two were expected to be published in 3-to-5 year cycles. All required interagency or intergovernmental cooperation.

The first is Environmental Quality, the annual report of the Council on Environmental Quality (CEQ). Environmental Quality reviewed events of the past year, identified new issues that required policy attention, and provided the latest information on conditions and trends. It contained, for example, analyses of water and air quality that were not available in any other publication. The annual report had become a major resource document in this country and abroad.

This year's report is months late. Given the drastic reductions in staff and budget at the Council, it is very unlikely that the quality of previous reports can be maintained.

The second is Environmental Outlook, prepared by the Office of Research and Development within the Environmental Protection Agency (EPA). The latest edition of Environmental Outlook was released in 1980. In addition to traditional air and water pollutant discharge estimates and projections, it included sections on global atmospheric pollution, drinking water, water resources, marine pollution, solid and hazardous wastes, toxic substances, radiation, noise, and a review of energy and the environment. Projections were usually made to 1985 and 2000.

The report brought together the latest scientific information on the emission of pollutants into the natural environment and began to assess the environmental implication of pollutant trends. It was much more than a simple modeling exercise. Not only was the report useful for the scientific information and trends data it contained, but it also made clear areas of research needed to protect the environment of the future.

The forecasting budget of EPA's Office of Research and Development has been cut in half, and there are no plans now to prepare the next report in 1983.

The third publication is Environmental Profiles. This graphical publication of environmental indicators was ready to go to press last summer. It has not been printed and probably never will be.

Environmental Profiles was an attempt on the part of EPA headquarters and EPA regional offices to coordinate their efforts at developing and using common indicators of environmental change. Key series were chosen for EPA's major programs: water quality, air quality, pesticides, radiation, noise, solid and hazardous waste, quality of lakes, and others. The project, from my perspective, was very effective and was beginning to have an influence on environmental protection programs at the regional and state level. One of its innovative features was the development and use of a Water Quality Index, which, for the first time, showed in map form which segments of major rivers were meeting state standards across the country. We could begin to see more clearly which regions were having the most difficulty in meeting Congressionally mandated water-quality goals.

It appears that some regions, with state cooperation, will ~~continue~~ to prepare profile reports periodically, on a strictly regional basis. But the coordinating function will be lost.

The last publication is Environmental Trends. Environmental Trends was prepared as "a national briefing book that brings to life the many numbers and figures that measure environmental quality." It contains a collection of charts, maps, and text that record key changes in the environment and related social conditions over the past few decades. Key statistical series in each major area of environmental concern were highlighted: air quality, water resources and water quality, land use and resources, energy, wildlife, population and human settlements, toxic substances, solid and hazardous wastes, and the biosphere.

This report was released by the Council on Environmental Quality last December and then effectively hidden from public view. The government's 9,000 copies were removed from the cosponsoring agencies and turned over to EPA for distribution to local public officials, without even an accompanying cover letter. No copies were made available to government officials in the cosponsoring agencies of CEQ, EPA, Fish and Wildlife Service, and the U.S. Geological Survey.

There are no plans within CEQ or the cosponsoring agencies to maintain the data base of over 400 key series or to update the publication.

These four major reports on the environment are supported in large part by detailed, ongoing efforts in environmental groups and agencies across the government and in the private sector. Many of these programs are having great difficulty in maintaining their research, data collection, analysis, and reporting functions. The result is that we are knowing much less -- and will continue to know much less -- about what is happening to our environment.

I'd like now to identify a number of cases in which changes in programs are occurring that are detrimental to environmental data. They cover the areas of water quality, water resources, air, noise, radiation, pesticides, ecological systems, international organizations, and global foresight.

WATER QUALITY

The National Ambient Stream Quality Accounting Network (NASQAN) has been developed over the past seven years by the U.S. Geological Survey. Its purpose is to monitor changes in water quality using samples taken from stations across the nation. Results and analyses are prepared for individual stations and can be aggregated statistically to larger units and to water regions.

The 1982 operating budget for NASQAN was cut from $5 million to $4 million. As a result, the number of variables monitored has been reduced from 30 to 27, and sampling at the more than 500 stations was reduced from a monthly to a bimonthly basis. The next cuts, expected to come this year, will require the Survey to reduce the number of stations, probably those located along coastal areas.

The monitoring of water quality on a national basis is a relatively new program. Past criticisms of national water quality monitoring by the GAO and by CEQ have stressed the need to expand the number of stations and increase the monitoring of toxic pollutants. The cuts now occurring take this important program in the wrong direction. Without the baseline data the NASQAN provides, programs aimed at controlling pollution will be less efficiently targeted, and we will be much less able to assess the results.

Trends in water quality using NASQAN data have been routinely analyzed by CEQ for the past few years. By comparing concentration levels of pollutants, CEQ has reported the number and percent of water quality violations for the nation as a whole. Funds for continuing this analysis in FY 1983 have been cut out of the budget.

The most important sources of toxic contamination of groundwater are impoundments and landfills. EPA regulations require owners and operators of these sites to comply with a number of reporting requirements, including preparation of quarterly groundwater monitoring reports, annual reports, and groundwater quality assessments. This year EPA has delayed its request for these reports in order to streamline or eliminate various reporting rules. This is one area in which it is imperative that the federal government, in cooperation with state and local governments and businesses, develop guidelines and procedures for monitoring, analysis, and reporting to protect both the resource and the public.

Coastal and estuarine waters have been monitored for a number of toxic pollutants on a consistent basis over the past 5 years. The EPA Mussel Watch program measures toxic substances in bivalve molluscs (mussels and oysters) at more than 100 locations along the Pacific, Gulf, and Atlantic coasts. Trend data are only now becoming available.

The budget for the Mussel Watch program was $625,000 in FY 82; the proposed budget for 1983 is zero. The justification given by EPA leadership is that this information is not needed to regulate toxic substances since it is not useful in monitoring compliance.

Mussel Watch is a relatively inexpensive monitoring program and, from most reports, very carefully done. Over time it could be turned over to the states or to local universities once detailed protocols were established. If this program is stopped now, we will lose an opportunity to monitor existing hot spots, identify new ones, and follow trends of banned and restricted pollutants.

Water-quality monitoring by other agencies may not show up in their budgets directly. It is therefore difficult to identify exactly how the programs are being changed. The Corps of Engineers, for example, has monitored the flow of water at dams and reservoirs for years. In the past decade, monitoring for water quality began. The Corps, faced with budget reductions, has already begun cutting its water quality monitoring.

The Clean Water Act of 1977 (Public Law 95-217) requires each state to prepare and submit to the EPA Administrator a description of water quality, including references to fish populations, recreational activities, control of pollution, and estimates of the impact and cost to society as a result of continuing pollution. The Administrator in turn is required to analyse the state reports and prepare a summary National Water Quality Inventory for transmittal to Congress. The state reports and the National Water Quality Inventory summary are to be prepared and submitted every other year.

The summary report of the 1979-80 state reports was prepared in March 1981 by the Monitoring and Data Support Division of EPA, but the report has not yet been released. The agency claims that the report is undergoing peer review. Other information suggests that the report was given low priority because of budget and staff cuts, reduction in publication preparation and printing funds, and, perhaps most important, because the report highlights continuing water-quality problems throughout the country.

The National Water Quality Inventory is important for two reasons. First, it encourages states to examine the full scope of water-quality problems on a periodic basis and leads to better program evaluation. Second, in recent reports, states have been encouraged by EPA headquarters to use comparable methods and indicators. Cutting back on this reporting process will reduce the availability of comparable and timely data and will make evaluation of programs that much harder.

WATER RESOURCES

The Water Resources Planning Act of 1965 (P.L. 89-80) mandates the Water Resources Council to prepare a national assessment of water in the United States. The National Water Assessment is to water resources what the Economic Report of the President is to economic well-being -- and more. It is data collection, analysis, and reporting on the overall use and projected use of water in the United States. The latest National

Water Assessment was completed in 1978. It included detailed use estimates for the year 1975 and projections for 1985, 2000, and 2020.

There are no plans for a third assessment. The professional staff of the Water Resources Council has been ordered to terminate all data activities by the end of FY 1982. (A low-level data collection and planning effort has been continued at the U.S. Geological Survey at $350,000 per year.)

Water assessment information is needed by many other agencies of the federal government to carry out land and water resource assessments, such as those required by the Resources Planning Act and the Resource Conservation Act. It is probably up to Congress to pass a law requiring the Executive Branch agencies to coordinate their efforts and maintain this important function.

AIR

The Pollutant Standards Index (PSI) is a highly summarized health-related air-quality index based on five of the criteria pollutants: carbon monoxide, ozone, sulfur dioxide, total suspended particulates, and nitrogen dioxide. The PSI is used locally, and the data can be combined for cities and groups of cities across the country.

The updating of the Pollutant Standards Index, routinely done by the Council on Environmental Quality and published in its annual report, will not be continued next year. The funds supporting this work have been cut out of the budget.

The preparation of this Index on an annual basis, in addition to giving the public a picture of urban air quality trends, provides one check on air quality monitoring at the local level.

The group within the Air Quality and Standards Office in EPA that carries out the assembling and analysis of ambient air quality trends has been reduced by 40%. This cut will surely affect the timeliness of their reports.

The development of national air pollution emission estimates are prepared at Research Triangle Park in Raleigh, N.C., by the National Air Data Branch. The principal data base, the National Emission Data System (or NEDS), is heavily dependent on computer data processing. The data are collected by the states and sent to EPA semi-annually. The data processing budget of this group, now in the midst of revising its systems, is being cut by 90% in the 1983 budget. This will slow the changeover to a more efficient system and may lead to an increase in errors in the reporting of the data.

The budget for indoor air quality research is being cut from $500,000 in 1982 to zero in 1983. With no Congressional mandate for EPA to regulate indoor air qualtiy, the agency will spend no funds on research. The picture here, though, is not as bleak as in other areas, since human exposure studies are continuing to be funded.

NOISE

All noise programs in EPA will have been abolished by the beginning of FY 1983. The principal data we will lose are the following:

1) National estimates of noise exposure by source.
2) Surveys of public attitudes and annoyance to noise.
3) Estimates of noise exposure at major airports.
4) Estimates of noise generation by industrial and construction equipment.
5) Studies on the direct and indirect health impacts from prolonged exposure to noise.
6) Data from studies of quiet communities which would help us understand the value people place on noise reduction in everyday life.
7) Methodological data on how to monitor noise exposure indoors and outdoors.

RADIATION

Monitoring human exposures to ionizing radiation is the responsibility of many different federal agencies, depending primarily on the source of the radiation. In 1976, in an effort to summarize recent findings in research and monitoring, the EPA Office of Radiation Programs initiated a periodical report entitled Radiological Quality of the Environment in the United States. One of its most important features has been the reporting of industrial and workplace studies on human exposures.

The most recent edition of this report has not been released to the public, even though it was completed almost two years ago and has cleared external peer review. The release of this report and the continuation of this program would help to inform the public about the extent and intensity of this most feared toxic.

PESTICIDES

The principal survey of farmers' use of pesticides, conducted by the U.S. Department of Agriculture and scheduled for 1981, has been delayed to the fall of 1982 and may be pushed to the spring of 1983. This survey, last conducted in 1976, and usually completed every 5 years, provides overall information on the amounts, types, and uses of pesticides by farmers. This survey helps to document shifting patterns in the use of herbicides and insecticides. Such information is needed, as rapid changes take place in the development of pesticides and their costs.

The National Pesticide Monitoring Program is a multi-agency, multi-media effort whose purpose is to monitor trends in pesticide concentrations in soils, water, air, wildlife, food, and human tissue. During the past decade, this program provided detailed information showing, for example, the increasing prevalence of PCBs in humans, and the decreasing concentrations of DDT in fresh water, fish, starlings, migratory waterfowl, and humans.

Cuts in the Office of Pesticide Programs at EPA have resulted in the following program changes:

1) Data on pesticide residues in urban soils were last collected in 1980. There are no funds for analyzing that data for publication of the results.

2) The cooperative agreement with the U.S. Geological Survey to monitor pesticides in fresh water was discontinued in 1981.

3) Air monitoring of pesticides was stopped in 1980.

4) The collection of data from human adipose tissue samples will continue through 1982, but there are no plans to publish the results.

5) Funds required to maintain some of the expensive laboratory equipment needed to conduct the sample analyses have been deleted from next year's budget.

6) It appears the publication of the Pesticide Monitoring Journal, where the results of these studies and those from other countries are routinely released, will be continued for one more year. Publication after that is under discussion.

In anticipation of future budget cuts, the Fish and Wildlife Service, responsible for the collection of pesticide data from migratory waterfowl, fish, and starlings, has sped up the collection samples from mallards from 1983 to 1982. If cuts in this program continue, our ability to monitor the widespread but changing contamination of pesticides will be weakened.

There are many other examples of data programs that are in trouble in the areas of land use, public lands, toxic substances, and ecological systems. Let me finish this list of domestic environmental statistics programs with an example from ecological systems.

ECOLOGICAL SYSTEMS

The budget for the threatened and endangered species program within the Fish and Wildlife Service was reduced from $22 million in FY 1981 to $17 million in FY 1982. The cutbacks came directly out of the federal/state matching fund program. As a result, data collection in the field, needed to support the listing and recovery of endangered species, was reduced. Not surprisingly, only one new species was listed as endangered during this period.

We have a law that rightly requires detailed information on a wild species or subspecies before it can be listed as endangered. The best way to make sure no new species are listed is to cut the budget of those collecting that information. That has happened.

INTERNATIONAL ORGANIZATIONS

The United States is a member of many international organizations that have environmental statistical functions. In most cases, there has been no explicit change in the policies supporting these data gathering and reporting programs. However, in reality, the degree of cooperation and participation has fallen off.

The Environment Committee of the Organization for Economic Cooperation and Development (OECD) has environmental reporting as one of its four major program objectives for the next two years. In the past, the United States has played a leading role in working with the Secretariat to develop a core set of environmental data and to prepare a state-of-the-environment report for member countries. The United States no longer participates in the meetings of the Group on the State of the Environment and is delinquent in completing the questionnaire that will provide the data base to prepare the next state-of-the-environment report.

A program on environmental statistics was started four years ago as a joint effort by the United Nations Statistical Office (UNSO) and the United Nations Environmental Programme (UNEP). Housed in New York City, the project's major purpose was to assist less-developed countries to improve the quantity, quality, and usefulness of their environmental statistics. With the FY82 reduction in U.S. support for UNEP, this project has been cut back severely. In the past, the UNEP contribution was 70 percent of the total. Unless there is a change in the financial picture at UNEP, its contribution to the program for 1982 will be zero.

The United States has participated in and supported the work of the Economic Commission for Europe to develop common classifications of water resources, water quality, land use, and land cover. The United States stopped sending delegates to meetings last year. In the process we miss an important opportunity to influence the development of international standards that make the comparison of environmental data more effective and efficient.

GLOBAL RESOURCES FORESIGHT

Just as the economic misfortunes of nations spill over to their neighbors, so do environmental problems. Actions taken (or not taken) in one country to abate pollution, to rapidly exploit fisheries and wildlife, to misuse its cropland and forest land, or rapidly deplete its surface and groundwater, influence the economic and social welfare of others.

With the release of the Global 2000 Report in 1980, the United States staked a claim in the world as one country that would look beyond its national borders to take a global view at how its policies influenced the rest of the world and vice versa. This was new territory for study and required new analytical tools, new data, and new kinds of institutions.

The official United States policy in support of this area has not changed. At a hearing, held by this Subcommittee last May on the Global 2000 Report, witnesses described the federal government's lack of a global foresight capability. They pointed out that the United States, although it could produce a Global 2000 report, still lacked the capacity on a coordinated interagency basis to monitor and analyze the trends in population, resources and environment and factor this information into United States policies.

Last December, A. Alan Hill, chairman of CEQ, announced the administration's plans to establish an Interagency Working Group on Global Issues. According to Mr. Hill, this working group, representing the senior level policy staff of the major departments and agencies of the federal government, would conduct its own review of global issues, assess how they affect or are affected by U.S. domestic and foreign policy, and recommend to the Cabinet Council on Environment and Natural Resources and to the President actions that the administration might undertake. Mr. Hill described the formation of a complementary Global Forecasting Team, a group of technical staff that would be assigned to "improve our sets of global data, improve the analytical and predictive models that are used in forecasting and analyses, and develop linkages among the models that deal with only small segments of global resources and environment."

What has become of this effort?

There was one meeting of the working group, no meeting of the global forecasting team, and the Council has just fired its senior staff person with professional experience in data collection, modeling, analysis, and use.

WHAT CAN BE DONE?

There have been many cutbacks in environmental statistics programs, particularly those efforts that lead to integrative analyses across traditional disciplines. These cutbacks suggest a concerted effort on the part of the current administration to reduce the flow of information needed by the public to judge how well the government and our society is doing to protect, maintain, and enhance the quality of the environment.

What can be done to turn this situation around?

First, this Subcommittee and many others in Congress can put pressure on the Executive branch to carry out the mandate of the law. Section 102(2)(B) of the National Environmental Policy Act directs all agencies of the Federal government "to identify and develop methods and procedures, in consultation with the Council on Environmental Quality...to ensure that presently unquantified environmental amenities and values may be given appropriate consideration in decisionmaking along with economic and technical considerations." The act further, in section 204, directs the Council on Environmental Quality to "gather timely and authoritative information concerning the conditions and trends in the quality of the environment, both current and prospective; to analyze and interpret such information for the purpose of determining whether such conditions and trends are interfering with the achievement of...environmental policy and to compile and submit to the President studies relating to such conditions and trends and to document and define changes in the natural environment, including the plant and animal systems, and to accumulate necessary data and other information for a continuing analysis of these changes or trends and an interpretation of their underlying causes."

Finally, Section 201 of the act requires the President to transmit an annual environmental quality report to Congress "to include the status and condition of the major natural, manmade, or altered environmental classes of the Nation."

Second, the Congress can look closely at the budget estimate and justification documents submitted by agencies in support of the 1983 budget. Congress can also ask OMB to prepare the 1982 Environmental Special Analysis that was omitted from this year's budget. Many important statistical functions are not explicitly outlined in budget documents. These data collection and analysis activities are likely to suffer the deepest cuts because they are not visible, the effects of such cuts may not be obvious for several years, and there is no vocal constituency to support data collection and analysis. Once the activities are cut, the damage may be irreparable because continuity is a necessary condition for the careful monitoring and understanding of environmental trends.

Third, this subcommittee, in conjunction with other committees and subcommittees that deal directly with environmental affairs in the federal government, could hold separate hearings on environmental and natural resource data and statistics. I have been able to assemble only a small number of cases of cutbacks and problems. Special hearings would give us a chance to fully document the changes occurring and their importance and to share this information with the Congress and the American public.

Let me conclude my testimony with a personal experience.

In 1977 I had the privilege of attending the first meetings of the OECD Expert Group on the State of the Environment. Country representatives were asked for a show of hands as to how many countries were then preparing periodical reports on the state of the environment. We were proud to be one of two countries, along with Japan, to be recognized for our efforts in this field. When the same question was asked last July, four years later, fifteen countries indicated they were working on such reports.

Not only has the United States been a leader in the development of environmental data and assessments, but we have also helped to influence the work of this important international organization and of its members. We are now losing that leadership role abroad -- and threatening the development and flow of environmental data at home.

I want to thank you Mr. Chairman for giving me the opportunity to share my views with you and other members this morning.

Mr. **Scheuer**. Thank you very much.

Now we will hear from Dr. Courtney Riordan of the Environmental Protection Agency.

If you will take 7 or 8 minutes, then we will have a chance to ask you questions as soon as Mr. Cohen finishes.

Dr. **Riordan**. Thank you, Mr. Chairman. I am happy to be here today to testify on current monitoring activities in the Environmental Protection Agency.

The Acting Assistant Administrator in the Research & Development part of the Agency, which, as you know, is long-term, covers a wide range of activities in the Agency in terms of research, regulatory development, and enforcement. For that reason, I have with me to help me answer some of the detailed questions about the program office monitoring members from various headquarter offices.

As I am sure you can appreciate, Mr. Ruckelshaus is just coming onboard, and there has been no time for him to focus on the important policy issues raised in your invitation. I can, however, provide you with an overview of the status of monitoring activities in the Agency that I believe are of concern to the committee.

The Office of Research & Development, for the most part, is responsible for developing methods and techniques for monitoring, as well as quality control procedures.

ORD has in the past operated, and continues to operate, some selected monitoring systems. In the exploratory area, ORD has funded the mussel watch program and the National Bureau of Standards human specimen banking program. ORD also supports the operation of the national inhalable particle air monitoring network, an acid deposition monitoring network, a background ozone monitoring network, and a small Western visibility background network. Just last fall, ORD began operation of a monitoring center in Philadelphia to demonstrate methods for measuring and characterizing toxic chemicals in ambient air.

The program offices in EPA are responsible for directing and supporting the environmental monitoring programs of the agency. Broadly speaking, the monitoring consists of ambient and source measurements for the purposes of problem identification and assessment, compliance with ambient or source standards, and evaluation of program effectiveness. The monitoring activities include both standing networks and intensive special studies and involve a mix of Federal, State, and local agencies.

I think the subcommittee is principally interested in ambient monitoring programs, so I will touch briefly on some of the major problems in this area and the Agency's response to them.

During the 1970's, several reviews identified deficiencies in the air criteria pollutant monitoring program.

In May 1979, EPA promulgated air monitoring and reporting regulations which significantly revised the previous regulations. Included in these revised regulations were provisions for: Uniform instrument siting criteria; Standardized monitoring methods and analysis techniques; Rigorous quality assurance programs; Daily reporting of an air quality index to the public.

The criteria pollutant monitoring system is now almost complete with 98 percent of the national stations and 94 percent of the State stations fully operational.

The Agency, at the current time, has no plans for establishing a routine, national noncriteria pollutant monitoring program such as we have for criteria pollutants. The reasons for this are manifold, having to do with the inadequacies of the present technology as we see them, the costs associated with such a monitoring program and the nature of the toxic air pollutant problem as we presently understand it in urban areas today.

For these reasons, ORD has recently established the air toxic monitoring center in Philadelphia, which I mentioned earlier, to evaluate new sampling and analysis techniques and to begin to characterize urban air in a typical industrialized city.

Water quality monitoring programs are currently undergoing a transition from the more routine, broad trend analyses commonly carried out in the 1970's to a more focused, flexible, problem-specific monitoring needed to carry out the Clean Water Act in the 1980's.

Current EPA programs are directed at compensating for several well-recognized deficiencies in the earlier approach, as well as at filling important gaps in our understanding of the water environment in the United States.

The Office of Water Programs is working to improve the way monitoring programs provide data for regulatory decisions. In addition, that office is working to improve the quantity of information available at the national level to analyze water quality problems and trends and to identify emerging problems.

An extensive monitoring program for drinking water quality exists under the Safe Drinking Water Act. About 60,000 public water systems ranging from as few as 25 persons up to the largest communities are covered by national standards.

The regulations include monitoring and reporting requirements and also provisions for certification of laboratories that produce this data on organics, selected inorganics, on turbidity and on coleiforms.

In addition EPA has conducted a number of analytic surveys of surface and ground drinking water supplies to identify various organic chemical contaminants.

The next area that I want to address is monitoring conducted in support of RCRA and Superfund. These efforts fall primarily in the area of ground water monitoring.

Under RCRA regulations, ground water monitoring at about 1,350 hazardous waste management facilities is performed by the facility owner and operator. The requirements are relatively new, with the first comparisons of upgradient and downgradient parameter values required as of today, May 19, 1983. The agency does not routinely conduct ground water monitoring at hazardous waste management facilities. Rather, the facility operator is responsible for conducting this monitoring. We do, however, conduct site-specific monitoring in support of Superfund activities and RCRA regulation development.

Before concluding, I would like to briefly touch on the effort of EPA to develop environmental results indicators that would enable us to evaluate the effectiveness of Agency actions to improve or protect the environment and public health. This effort addresses past concerns that we have not used our environmental data to manage our programs and to determine whether they are achieving our environmental goals.

We have identified a continuum of possible types of indicators against which environmental results can be measured. They range from programmatic or administrative indicators such as compliance rates or the number of permits issued, to "ultimate impact" indicators such as reduced incidence of pollution-related disease or return of certain types of fish to formerly polluted streams.

That concludes my statement. My associates and I would be happy to answer any questions.

[The prepared statement of Dr. Riordan follows:]

STATEMENT OF
DR. COURTNEY RIORDAN
ACTING ASSISTANT ADMINISTRATOR
FOR RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES,
AGRICULTURE RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

MAY 19, 1983

I am happy to be here today to testify on current monitoring programs in EPA. With me from EPA Headquarters are Lew Crampton, Office of Policy and Resource Management; Ned Notzon, Office of Water Regulations and Standards; Fred Lindsey, Office of Solid Waste; and Joe Cotruvo, Office of Drinking Water. Dick Rhoads from Research Triangle Park is representing the Air Program.

As I am sure you can appreciate, Mr. Ruckelshaus is just coming on board, and there has been no time for him to focus on the important policy issues raised in your invitation. I can, however, provide you with an overview of the status of monitoring activities in the Agency.

EPA recognizes that the primary monitoring responsibility lies with the States; we also recognize that a strong partnership is required between EPA Headquarters, its Regions, and the States in order to most effectively use existing monitoring resources in meeting this responsibility. To this end, EPA Headquarters provides guidance and technical assistance to the States. It also is responsible for planning and conducting studies of national significance (in cooperation with other Federal agencies, where necessary).

The EPA Regions work closely with the States to ensure that program guidance is translated to field activities that make sense at the local level. The Regions also work cooperatively with the States and with other Federal agencies in responding to specific local needs.

The Agency's monitoring efforts fall primarily under three Acts -- the Clean Air Act, the Clean Water Act, and the Resource Conservation and Recovery Act (RCRA). The monitoring responsibilities lie primarily with EPA's various program offices. My office provides supporting research and quality assurance support. We do this by developing and validating sampling and analytical methods and procedures, and ensuring adequate quality control.

In general, air and water monitoring include a complex range of activities, involving EPA and other Federal agencies and State agencies. Most of the activities are designed to provide direct support to many pollution control activities, such as setting standards, establishing permit conditions, assessing compliance, evaluating trends and investigating causes and effects of environmental pollution problems. Therefore, monitoring systems by necessity will vary to meet individual State or Federal needs. The following discussion concentrates on ambient vs. source and effects monitoring activities.

AIR MONITORING

The Air Monitoring Program falls primarily in two distinct areas -- criteria pollutants (SO_2, NO_2, ozone, Total Suspended Particulates (TSP), CO and lead) for which National Ambient Air Quality Standards (NAAQS) have been established; and non-criteria pollutants, i.e., all those for which NAAQS have not been issued.

CRITERIA AIR POLLUTANT MONITORING

During the 1970's, several critical reviews of environmental monitoring programs identified major deficiencies in several aspects of the monitoring programs at that time. A Standing Air Monitoring Work Group (SAMWG) composed of representatives of EPA, State and local agencies was formed to review and provide recommendations to overcome these deficiencies. After an extensive and comprehensive review of the air monitoring program, SAMWG issued an air strategy report which recommended revisions to the monitoring program.

The Environmental Protection Agency in May 1979 promulgated air monitoring and reporting regulations which significantly revised the previous regulations in response to both the SAMWG recommendations and also the requirements of Section 319 of the 1977 Clean Air Act. The major elements of the air monitoring program as specified by the revised regulations are:

1. State and Local Air Monitoring Stations (SLAMS) designed to meet the needs of State and local agencies;

2. National Air Monitoring Stations (NAMS) designed to meet the needs of EPA. The NAMS are a subset of the SLAMS;
3. Standardized network design criteria;
4. Uniform instrument siting criteria;
5. Standardized monitoring methods and analysis techniques;
6. Rigorous quality assurance programs;
7. Daily reporting of an air quality index to the public;
8. Quarterly and annual reporting of basic air quality data to EPA; and
9. Annual review of all monitoring networks.

At present, there are 4675 SLAMS meeting all substantive requirements of the regulations, including operating under the rigorous quality assurance program. These monitors constitute 94 percent of the total monitors planned for the SLAMS network. The NAMS are a subset of the SLAMS network and number 1370 monitors. At present, 98 percent of the NAMS meet all substantive requirements of the regulations.

The 1982 GAO report entitled "Problems in Air Quality Monitoring System Affect Data Reliability," was very critical of the monitoring program. However, the report did not criticize the substance of the program, only the timing. Due to an apparent misinterpretation of some data, GAO feared that implementation of the program was being delayed. The fact that 94 percent of the SLAMS, and 98 percent of the NAMS are now fully operational proves that those fears were unfounded.

AIR TOXICS MONITORING

The Agency, at the current time, has no plans for establishing a routine, national non-criteria pollutant monitoring program such as we have for criteria pollutants. This is due to three main factors.

1. Most air toxic pollutants are emitted by specific emission sources which are not widespread throughout the Nation. Thus, they tend to be a more localized problem which is better controlled through emission standards rather than the air quality standard/State implementation plan process. Monitoring, therefore, would be point source oriented.

2. The measurements are complicated as well as costly. Monitoring many of the toxic pollutants of interest involves new or relatively untested techniques which require highly trained individuals. It is only recently that inter-laboratory field testing of the methods has been initiated to determine the accuracy and precision of the methods.

3. The sampling and measurement technology is evolving. New techniques both for air sampling and analysis are being developed rapidly.

For these reasons, the Agency in FY'83 set up one air toxic monitoring center in Philadelphia to accomplish the following:

1. Evaluate new sampling and analysis techniques;
2. Field test experimental methods which are in development;
3. Evaluate personal exposure monitoring techniques; and
4. Begin to characterize urban air in a typical industrialized city.

Generally, the operation of the monitoring center would result in quantitative data for a limited number (on the order of 30 to 50) gaseous compounds as well as qualitative data for a broad spectrum of pollutants.

If this monitoring center approach is successful, we currently have sufficient resources to expand to an additional location where State and local agency personnel could be trained in the latest monitoring techniques. In FY'84 we also intend to provide the States with guidelines pertaining to methodology, siting of samplers, network design and quality control practices.

RESEARCH IN SUPPORT OF AIR MONITORING

A major research effort in support of monitoring criteria air pollutants is the current establishment of a 100-station Inhalable Particulates (IP) Network to collect fine and coarse inhalable particles and determine their mass and chemical composition. We are now concluding the development phase of this network and will be turning it over to the States for their continued operation in 1984. We support several other air monitoring efforts including the National Crop Loss Assessment Network, two networks which monitor acid deposition, and one which operates in remote areas of the U.S. to provide background levels of ozone. We have also developed a small monitoring network in the Western States to support our research on visibility.

We offer direct support to the National Air Monitoring Stations and State and Local Air Monitoring Stations by performing chemical analyses of some of their glass-fiber filters, and the results are stored in a national data bank. We also maintain the National Filter Analysis Network (NFAN) to follow trends in ambient concentrations of fifteen trace metals.

We are continuing to develop and standardize new methods for monitoring ambient and source pollutants. One such effort involves working with the National Bureau of Standards to evaluate a personal monitor which can measure exposure to both inhalable particles and metals, including lead. We have recently carried out a major developmental monitoring study of exposure to carbon monoxide in Washington, D.C. and Denver. The study was designed to link continuous measurements of exposure to CO with the breath CO levels of the exposed individuals. Fixed site data will be compared to the personal exposure data to determine how well fixed monitoring stations can predict actual exposure.

WATER MONITORING

Water quality monitoring programs are currently undergoing a transition from the more routine, broad trend analyses commonly carried out in the 1970s to much more focused, flexible, problem-specific monitoring needed to carry out the Clean Water Act in the 1980s. Current EPA programs are directed at compensating for several well-recognized deficiencies in the earlier approach, as well as at filling important gaps in our understanding of the water environment.

In 1981, a GAO report entitled "Better Monitoring Techniques Are Needed to Assess the Quality of Rivers and Streams," criticized the fixed station networks because of limited sampling frequency, inadequate justification for location of sampling sites, and inconsistent field work and laboratory performance. GAO made two recommendations: that EPA and the U.S. Geological Survey discontinue the Nation's fixed station water quality networks and concentrate instead on a program of special studies of water quality; and that other indicators of progress toward cleaner water be promoted.

EPA disagreed with the specifics of the first recommendation. However, as discussed below, EPA is investigating the use of other techniques to supplement fixed station analyses. Our disagreement to the first recommendation was based on three major reasons. First, no viable alternative to national fixed station networks was then, or is yet, available. Further, the GAO report did not address how the results of local intensive surveys would be aggregated on a national scale or how the program could be designed to provide statistically meaningful estimates of national water quality. Second, the report did not adequately recognize the high costs--both in money and time--of conducting a special studies program. And third, EPA believes that withdrawing support for the national networks would seriously disrupt State programs that rely on fixed stations as part of a balanced monitoring program to meet State needs.

EPA did agree with the second GAO recommendation that more emphasis is needed on special studies and other indicators of pollution, especially biological monitoring. States need this type of data to carry out their responsibilities.

EPA is taking positive action to overcome the recognized deficiencies.

First, we are working to improve the way monitoring programs provide data for regulatory decisions. Specifically:

- We established a senior group of monitoring data users as a Standing Work Group on Water Monitoring, including representatives from States, EPA Regional Offices, industry groups, and environmental groups. This Group now regularly provides useful information exchange to help develop program and technical guidance.
- We are strongly encouraging and assisting the States to improve their use of biological monitoring as part of a balanced program.
- We are encouraging and assisting the States to make use of local cooperative monitoring agreements to improve the effective use of existing monitoring resources, and to involve the regulated community, where appropriate, in collecting and analyzing monitoring information.
- We have instituted mandatory quality assurance programs for all EPA and State monitoring programs, and are developing practical guidance for integrating QA into the design and execution of all monitoring projects.
- We are developing data management techniques and systems to help ensure more efficient use of data once it is collected, including a River Reach File to organize all the different kinds of data in a logical, hydrologic structure.
- We have integrated monitoring into the Office of Water's Priority Work Plan for the Standards-to-Permits Process, a management plan we are using to guide our development of EPA's policies and guidance for the water quality-based approach.

Second, EPA is working actively to improve the quality of information available at the national level to analyze water quality problems and trends and to identify emerging problems. Our activities include:

- A grant awarded to the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) under a cooperative agreement with EPA to develop improved measures of national progress in the clean water program. This program, called STEP (States Evaluation of Progress), will result in a joint State-EPA report on the quality of the Nation's water over the last decade, and will help us improve the extent to which Section 305(b) reports can provide a consistent national overview; and

- A test of an approach that is designed to develop reliable estimates of the quality of the Nation's waters. This test is entitled The Aquatic Life Survey and is being conducted jointly with the U.S. Fish and Wildlife Service to develop reliable estimates of the biological quality of the Nation's waters. By questionnaire, the survey gathers biological information on fish communities for a probability sample of the U.S. rivers and streams. The first phase of this survey is now complete and undergoing peer review. The feasibility of using this approach to supplement or redefine fixed station monitoring is currently being studied.

MARINE MONITORING

In the marine monitoring area, our focus to date has been on special studies conducted at ocean dumping sites. We are now expanding that focus to include Section 404 (CWA) sites and other sites which have been identified by our Regional Offices as potential problem areas. We own our research vessel, and have been using it extensively along the East and Gulf coasts for these special studies. EPA has submitted legislation to recover the costs of their monitoring activities where they specifically support site designation activities.

RESEARCH IN SUPPORT OF WATER MONITORING

Our research program in support of water monitoring falls into two general areas, that dealing with industrial effluent and that concerned with documenting water quality.

The former deals with the methodology promulgated by EPA to monitor compliance to discharge permit levels of pollutants for evaluation and standardization. In addition, we will publish sampling regimes for the priority pollutants in effluent and dredge spoil. The program maintains a comprehensive quality assurance function which distributes calibration reference materials, audits performance of laboratories and personnel, and issues guidance for the operation of the monitoring methodology which it promulgates.

In addition to methodology which quantifies specific pollutants, methods are being developed to respond to broad classes of pollutants. These methods are often biological rather than chemical and provide a cost effective means of monitoring the quality of numerous effluents. The methods themselves can become discharge limiting permit parameters, for example, for toxicity.

The main thrust of monitoring research in the water quality area is the provision of techniques for documenting the quality of receiving waters--both fresh and marine. Chemical and biological methods are evaluated and standardized to document toxic levels of contaminants in water, sediment, and/or biota.

HAZARDOUS WASTE MONITORING

The third area that I want to address is monitoring conducted in support of RCRA and Superfund. These efforts fall primarily in the area of ground-water monitoring.

Under RCRA regulations, ground-water monitoring at about 1350 hazardous waste management facilities is performed by the facility owner and operator. The requirements are relatively new, with the first comparisons of upgradient and downgradient parameter values required as of today, May 19, 1983. The Agency does not routinely conduct ground-water monitoring at hazardous waste management facilities. Rather, the facility operator is responsible for conducting this monitoring. We do, however, conduct site-specific monitoring in support of Superfund activities and RCRA regulation development.

The RCRA ground-water monitoring requirements apply to new and existing facilities that treat, store or dispose of hazardous waste in surface impoundments, waste piles, land treatment units and landfills. The monitoring systems must be operated during the unit's active life, and for the 30-year post-closure period unless the waste is removed at facility closure. Exemptions exist for new units where the design includes positive detection of any discharge (e.g., a unit with a double liner and leak detection system between the liners) and for hydrogeologic locations in which there is no potential for migration of liquids to the aquifer during the required monitoring period. There are temporary waivers for existing neutralization surface impoundments demonstrating that treatment is effective, and for existing facilities demonstrating a low potential for contaminant migration to water supply wells or to surface water.

All facility monitoring systems must establish background ground-water quality of that ground water which is most likely to become contaminated as it passes beneath the facility. New and existing units must provide samples immediately downgradient and upgradient of the unit. These samples, representative of any ground water which would be contaminated by the facility, must be analyzed for parameters capable of indicating the presence of hazardous constitutents in ground water.

When statistically significant changes are observed in the values of the indicator parameters, the concentration of all hazardous constituents in the ground water must be determined and the discharge reported to the Regional Administrator. Subsequently, the facility operator must monitor semi-annually for compliance with a site-specific ground-water protection standard which is established in the permit.

If the ground-water protection standard is exceeded, contaminants must be removed from the ground water. The monitoring system must be capable of determining the effectiveness of the required corrective action program. In addition to compliance monitoring at the immediate edge of the waste management area, downgradient sampling may be required to assure that the corrective action program is effective.

RESEARCH IN SUPPORT OF HAZARDOUS WASTE MONITORING

Under our research program, methods are developed and their application demonstrated to hazardous waste monitoring. Among those techniques are gas chromatography (GC)/mass spectrometry and GC Fourier transform--infra-red spectroscopy. A protocol for Biological Methods, and Virology Sampling and Analysis are being published.

Field evaluation of protocols, which themselves are assembled from previously published techniques, is also performed. One such technique measures the toxic effects of metals on native aquatic biota.

And, of course, a quality assurance program tailored to the unique needs of waste monitoring is maintained. This covers both biological and chemical analyses. Calibration materials performance evaluation, method validation, and equivalency determination are the key components of this program.

ENVIRONMENTAL INDICATORS

Before concluding, I would like to briefly touch on the effort of EPA to develop environmental results indicators that would enable us to evaluate the effectiveness of Agency actions to improve or protect the environment and public health. This effort addresses past concerns that we do not use our environmental data in managing our programs and in determining whether they are achieving our environmental goals.

We have identified a continuum of possible types of indicators against which environmental results could be measured. They range from programmatic or administrative indicators, such as the number of permits issued or compliance rates, to "ultimate impact" indicators such as reduced incidence of pollution-related disease or return of certain types of fish to formerly polluted streams. Each Assistant Administrator has been asked to determine what combination of existing ambient, pollutant removal, and compliance data would be most appropriate to use in assessing whether programs are meeting their environmental goals, and to begin to report against those indicators in the fourth quarter of this year.

We are asking each Headquarters office, in close consultation with the Regions, to identify the environmental indicators they can report against now (that is by the end of FY'83) as well as those which should be reported against in the future, but which would require changes in the monitoring or data reporting and storage efforts the programs have under way. We recognize that these indicators will need to be reviewed over time, since environmental improvements frequently take considerable time to show up after control actions have been taken. However, we believe the final set of environmental indicators will provide the Agency, the Congress, and the public with an effective way of tracking environmental status and trends and emerging environmental problems, and of assessing whether program strategies are bringing about expected environmental improvements.

That concludes my statement. My associates and I would be happy to answer any questions.

Mr. SCHEUER. Thank you very much, Dr. Riordan.

Now Philip Cohen from the U.S. Geological Survey. Your speech will be printed in its entirety in the record. Then we will have a chance to ask all four of you some questions.

Our distinguished minority colleague from Rhode Island will be back in just a few minutes.

Mr. COHEN. If I may, I would like to avail myself of your suggestion that we chat informally with the committee.

Mr. SCHEUER. Please do. I have been waiting, sadly.

Mr. COHEN. In that regard I have a number of briefing boards which I think the committee will find most interesting and I think quite relevant to your deliberations. At that point I will depart from my formal remarks and speak to the briefing boards.

Mr. SCHEUER. We will give you a bonus point.

Mr. COHEN. Perhaps a couple of additional minutes, Mr. Chairman.

Mr. SCHEUER. Go ahead.

I will tell you what you can do, if you want to bring those charts up here, there are only just three or four of us. We can see them up here and the rest of the audience can see them, too. You sit right down there and talk into the mike.

Mr. COHEN. Thank you, Mr. Chairman.

Mr. Chairman, you have been told by two witnesses this morning and I am sure you will be told again as the hearings progress that much needs to be done in the way of monitoring the environment and that monitoring systems have significant weaknesses. They have made reference to a GAO report of 1981 which took particular exception to some of the work that we in the USGS are doing.

Our response to that report was in part, "GAO be patient. It takes time to collect data, valid scientific data, and it takes time to analyze these data," even when we attempt to do it in a cost-effective way. That is another way of saying that we think that some of the modest on-going programs of the USGS provide some very useful information and in fact are giving the nation the kind of information it expects and needs.

We have as our mission, very simply, to evalute the mineral and water resources of the Nation and we have been doing that for more than 100 years, collecting the water information, data, doing research, and conducting areal investigations. It is only in the past decade or so that the word "monitoring" has been applied to some of the work we are doing.

Whether it is monitoring or not, we think it is relevant and important to the mission of this committee.

The first board is based upon data collected at 50 some odd stations called our benchmark network. We established this network in 1958, in selected places throughout the United States where we expected there would be little or no direct impacts as a result of the activities of man, so that we could look at some of the phenomena which we are now beginning to look at and see.

In other words, these were stations selected in national parks, in other areas in which there were virtually no activities of man, and in which we could be somewhat certain that those activities would not occur. Streamflow data have been obtained since 1958 and water-quality data since the mid-1960's. The board you see here shows the results of measuring the chemistry of streamflow at these 50 some odd stations. The two parameters are sulfate in streamflow and alkalinity, which we would like to call to your attention. These are statistical analysis of trends.

We would like to point out here two significant trends. In the Northeastern part of the United States where we have our most severe documented cases of acidification of the Nation's lakes and streams, we see sulfate decreasing significantly for the past 15 years.

In other words, one of the primary acid-related chemical constituents is decreasing rather than increasing.

Next board, please.

The data on this board refers to the chemical property of alkalinity, the ability of water to neutralize acid.

Almost coincidental with the decreases in sulfate in the Northeastern United States, we see increases in alkalinity. Again, confirming that the situation is in fact improving in the Northeastern United States, a highly significant observation, we think; one that has been made on the basis of fixed-station, fixed-interval monitoring type techniques, techniques sometimes questioned with regard to their utility.

Next board, please.

Beginning in the early seventies and completed by about the mid- or late seventies, we established a network called NASQAN in which we measure streamflow and stream quality at approximatey 500 stations with the goal of measuring the flow and quality of about 95 percent of the Nation's streamflow.

The data that you see here represent trends since 1975, statistical measures of all the data collected at the stations. We see a very dramatic downturn in fecal streptococci throughout the United States. We are uncertain as to the causative effects, but the statistical validity of these data are beyond question, we think.

We can hypothesize this that in part relates to more rigorous regulation of feedlots and perhaps in part to the effects associated with improved control of point sources of pollution.

Next board, please.

Here is a rather dramatic reversal where the data indicate we may be looking at some deterioration; that is, increases in Kjeldahl nitrogen throughout most of the United States, at least in those areas in which we can detect trends.

We speculate that the improved trends in Kjeldahl nitrogen may be related to increased use of fertilizers and, perhaps, to the recent drought during which accelerated soil erosion may have caused increases of airborne fertilizers associated with dust.

Next board, please.

Last year we testified to the effect that this network of gaging stations detected significant chromium concentrations in waters in the Western part of the United States, chromium being a highly toxic substance. We believe this result is related to the fact that the Western part of the United States is the area commonly more mineralized and the chromium are associated with natural occurrence in the metal in the rocks.

Here we look at the trends in chromium, most of which are significant trends in the eastern part of the United States, where we believe the chromium is associated with industrial activity.

Next chart, please.

Another highly significant network that is just now being developed by an interagency effort, a National Trends Network, approximately 150 stations which is only now beginning to be put into operation to measure acid rain, the chemistry of precipitation throughout the United States, to do what we have been doing with our NASQAN network in terms of the chemistry of the receiving waters. Now we are going to look at the chemistry of precipitation, itself, an improvement upon the presently existing precipitation monitoring network.

Mr. SCHEUER. Is NASQAN an acronym for something?

Mr. COHEN. National Stream Quality Accounting Network.

The potential utility of a network of this type here is a map showing the pH or hydrogen ion concentration, a direct measure of acidity of the Nation's precipitation. This is based on an older network, 1981, again very dramatically confirms the general perception of where the low pH, high acidity of waters occur.

Mr. SCHEUER. Excuse me. We saw maps a year or two ago that showed the beginning of a serious acid rain problem in the Northwest, Washington, and Oregon. I notice that is not reflected in that map.

Mr. COHEN. That map does not, you are correct, Mr. Chairman, does not reflect a serious situation with regard to the acidity of the precipitation, nor do these streamflow data we have been collecting at our NASQAN stations show that impact.

However, in the winter of 1980–81 we collected and we do not have that board here, but we conducted a snow survey for that entire winter season in the Northeastern part of the United States attempting to: (*a*) examine the patterns that we have seen in our streams and precipitation and (*b*) get additional detail.

Those data have in fact been made available and I believe they are readied for publication right now. We are doing the same thing, just completed doing the same thing in the Cascades, Sierra Nevada. Six months from now those data should be interpreted and we should have more definitive.

Mr. RICKERT. I call your attention to the two figures on the benchmark systems and they do show that in the Northwest three of the four stations that we have sulfate concentrations in streams are increasing at three out of four stations. So maybe this is tied in. And I would like to show you the other one again, the alkalinity.

Alkalinity is a presumed based on precipitation. You can see that in three of those four stations alkalinity is decreasing.

Mr. SCHEUER. If the problem of alkalinity in acid rain is not a problem unique to the Northeast, then the country and the Congress shouldn't perceive of it as being uniquely in the Northeast.

Mr. COHEN. That is precisely the point being made by the administration at the present time.

Mr. SCHEUER. Being made by the administration.

Mr. COHEN. Yes, sir.

Mr. SCHEUER. By the administration.

Mr. COHEN. Yes, sir. That the available scientific information, as one begins to look more closely and carefully, indicates that the system is far more complex than a simple model of industrial activity in the heartland of the Midwest; air transport of certain chemical constituents, deposition in the Northeast and acidification of the lakes. We are seeing a great deal more than that, Mr. Chairman.

With expenditures of very, very modest amounts of money. These expenditures and our conclusions we believe support the administration's positions of going very slowly before we commit billions of dollars to addressing this problem at the smokestacks, because, in fact, we are looking at 15 years of improvement in the areas that have been most severely impacted.

Mr. SCHEUER. Would you repeat the explanation of doing little or nothing.

Mr. COHEN. That was—going slow in terms of imposing multibillion dollar expenditures on cleaning up smokestacks immediately. That is difficult. What needs to be done is a great deal of careful investigation to confirm, (*a*) in fact these trends are real and we think that these trends will continue and will stand rigorous peer review by scientists and others, that is the first thing; (*b*) the Federal Government is now developing a new extensive network, as I indicated on one of the boards, of water atmospheric deposition stations to measure the chemistry of precipitation throughout the United States in a uniform consistent manner, using the same standards, the same analytical techniques, same methods of collection so we can get a good picture rather than having to pull bits of data here and bits of data there.

Clearly we have acid—serious acidified lakes in the northeast. But were those lakes acidified in the fifties, forties, thirties, twenties, and why are they improving over the last 15 years, and what will be the trends if in fact we do not commit billions of dollars to addressing the problem at the smokestacks?

Mr. SCHEUER. Are you going to wait another 10 or 20 years to see what the trends will be?

Mr. COHEN. If the data indicate that the problem is in fact getting better and better, it might be something we would want to look at on a year-to-year basis, Mr. Chairman.

Mr. SCHEUER. Is there any information indicating there is less acidification and that the problem of acid rain is ameliorating some way in the northeast, in the Adirondacks area?

Mr. COHEN. Yes, the two boards I explained do in fact indicate that sulfate content in those waters is decreasing. It is the sulfate content, which is one of the two primary acid-forming constituents, it is going down. But at the same time the alkalinity is going up. Both of these observations indicate that the degree of acidity of those waters are improving rather than becoming worse.

Mr. SCHEUER. And what is presumed to have caused that phenomenon?

Mr. COHEN. There have been some crude correlations made by others that in fact they are lesser amounts of emanations of the sulfur-dioxide, the oxides of sulfur and the oxides of nitrogen. One need only go to Pittsburgh and view it Pittsburgh at the present time and remember what it looked like 30 years ago. There have been rather significant improvements in air quality.

Mr. SCHEUER. Pittsburgh is in the State of Pennsylvania, if I recall correctly. We have what is called the Ohio River Basin. Is there any indication that those smokestack industries are going to emit less in the way of sulfates and that they are going to cause less in the way of acid rain, left to themselves, left to their own devices?

Mr. COHEN. I can't comment on that. I can comment on our experiences. Namely the impacts of all these activities as felt in the receiving waters. In other words, all of these activities aggregated together the impacts we are observing are an improvement in the situation we are viewing in the receiving waters.

Mr. SCHEUER. Have you talked to Canadian scientists?

Mr. COHEN. Canadian scientists have seen our data; they in general agree that our observations are valid.

They are not very happy with these observations because they are contrary to the current view of the Canadian Government as to what needs to be done.

Mr. SCHEUER. All right. They are scientists. They don't adhere to anybody's politics. They are men of integrity.

Mr. COHEN. I think it is fair to say that the scientists who viewed these data concurred with them, the Canadian scientists. Dr. Pickering.

Mr. PICKERING. I am Jack Pickering, chief of the quality of water branch, geological survey. I think the nature of this report——

Mr. SCHEUER. Are you here in Washington?

Mr. PICKERING. Yes, sir. I think the nature of this report being just recently developed data and from a not-yet published report, we really haven't had the opportunity to get a full reaction from the Canadian scientists. I think as far as the question of methodology used, the scientists would not question the trend analysis methods or the general reasoning on the observations. I don't think we can say at this point that the Canadian scientists fully subscribe to the results because the results have not been published. There are a number of scientists who are aware of what we have been doing and we have no disagreement in general.

Mr. SCHEUER. When are these results going to be published?

Mr. PICKERING. The manuscript has been submitted to Science Magazine and we hope within the next few months.

Mr. SCHEUER. Can you send us the manuscript to be published as part of this hearing?

Mr. PICKERING. Prior to publication you are asking for?

Mr. SCHEUER. Sure.

Mr. PICKERING. I guess I would defer to Mr. Cohen on the answer to that.

Mr. COHEN. Yes, sir. We can submit the publication for approval at least to our director and as soon as it is released we can provide it to you.

Mr. SCHEUER. I didn't get that.

Mr. COHEN. The process in the Geological Survey, we will request approval from our director for public release and we will provide a copy to you of the manuscript as soon as it is approved for such release.

Mr. **Scheuer**. Very good. We would appreciate that. How soon do you think that might be?

Mr. **Cohen**. The author is here, the author of the manuscript.

Mr. **Pickering**. Richard Smith.

Mr. **Cohen**. Richard Smith.

Mr. **Smith**. As Mr. Cohen indicated, the manuscript has already been submitted to the journal Science. The manuscript has already received our director's approval so there is no problem there really. There is some problem, I believe, with the interested journal which has the first right to the publication. In other words, we would have some concern that release of the manuscript to the committee might jeopardize our ability to have the thing published. I might point out that that jeopardy, what we would be jeopardizing there would be publication. Publication will be very—in a non-government publication—will be crucial, I would say, to establishing the independence, let us say, of the results from political influence or from—

Mr. **Scheuer**. All right. We have absolutely no issue whatsoever to impede the publication of your report in the proper non-government publication, none whatsoever. So let us leave that alone.

Could we have the study to review, could we have the opportunity to review it ourselves?

Mr. **Smith**. Yes, I am sure that is possible.

Mr. **Scheuer**. All right. If you can make it available to us we would appreciate that.

Mr. **Smith**. My understanding is there are only about 4 weeks required for us to get an answer back from Science as to whether they are interested in publishing it.

Mr. **Scheuer**. Fine. If you can, be in touch with us, and if for any reason they don't want to publish it, we could, I would think. How long is it?

Mr. **Smith**. The report is only 7 pages long.

Mr. **Scheuer**. All right. I am sure they will publish it. But in the event they don't, get in touch with us and we will in some way. In the meantime, we would like to review it on a confidential basis if that is all right.

Mr. **Smith**. Sure. I might take the opportunity as long as I am here to add this: The point came up about Canadian awareness of the information and so forth, Canadian support or nonsupport for information. One of the things that we have tried to do in the paper is to show that existing data, on air emissions of sulfur do correlate with the trend Mr. Cohen showed on the chart. That is they show some indication of decreases in the emissions of sulfur to the atmosphere in the Northeast and they also show some hint that sulfur emissions in the atmosphere are rising in other parts of the country. Those data are data that were collected by an international commission, that is the Commission on Trans-Boundary Air. So, they do have clearly the support of the Canadian scientists and Canadian Government. I would point out that that is for non-Geological Survey data. It is simply emission data we have attempted to correlate with the trend in stream chemistry which we see and which Mr. Cohen described to you.

Mr. **Scheuer**. Well, obviously if the problem is righting itself through natural process that I don't quite comprehend, that I don't quite fathom at this moment, nobody wants to impose hundreds of millions of dollars or billions of dollars worth of capital expense on industry for no useful purpose. As we have said up here times without number, we want the American enterprise, the so-called smoke stack industries to be able to compete in global commerce. We want to get consumers the cheapest possible price for energy, for electricity. We have absolutely no wish to impose any costs for reducing pollution that are not cost-effective and that are not merited by the intrinsic nature of the problem.

So, if the problem seems to be such that natural causes seem to be on the way to producing a solution or a diminution of the problem, that would be cause for celebration all around.

Mr. SMITH. I would certainly want to make it clear that it is not our position, either my own, as an author of a particular paper, and I think I can speak for our organization, that it is not our position that we are out of the woods or that there has been a large turnaround in the significance of the problem. It would be a large mistake for you to adopt that interpretation. The important result is we see some evidence of a reduction in sulfur content of streams and it does appear to correlate with available data indicating a reduction in sulfur emissions. There are other compounds to be concerned about, certainly levels of nitrogen are equally important in the acid precipitation problem.

So, I wouldn't want a conclusion that we are saying that there is clear evidence that the problem is going to solve itself, as you say. We are stopping far short of that. We are saying that we see small decreases over the last 10 years or 15 years in levels of sulfate in streams and there have been other scattered reports that would tend to agree with it. The outside non-Federal data would tend to agree with this. I think the thing that we can provide here is a larger number of stations and a geographic spread of stations across the country so that we can see not only these trends in the Northeast which show slight decreases in the problem but also a number of indications of a deteriorating situation, or an increase in acid precipitation in other parts of the country.

Mr. SCHEUER. In 1981, the GAO in a report criticized the NASQAN Network Water Quality Monitoring Report. Were these results that you are adducing produced by that network?

Mr. COHEN. Mr. Chairman, the GAO report indicated that the NASQAN Network could not achieve certain goals and objectives and we fully agreed with them.

They advocated that we adopt in lieu of the NASQAN Network a technique referred to by Mr. Lyon in his testimony, intensive river quality assessments. It has been our position that what is needed is in fact a mixture of both fixed-station fixed-interval monitoring such as that of the NASQAN Network and intensive river quality assessments.

Mr. LYON. Mr. Chairman, I would like to underscore the point that Mr. Cohen made. I am concerned about the apparent reduction in sulfates in the Northeast. I know, for example, that in Pennsylvania those reductions are to a large extent due to the dimunition of mining. We had a big acid mine drainage problem in Pennsylvania. Many of our deep mines have closed and filled up and there has been a very significant reduction, both in the acidity and the sulfate of our streams. I think part of what is being observed there is a result of the reduction of mining in the Northeast and not, possibly, due to the diminution in the acid rain. This is why the intensive studies that Mr. Cohen is referring to are valuable.

Mr. COHEN. May I comment, Mr. Chairman.

As a matter of fact I am delighted to report to you that we do have some reports that we can provide you which relate directly to the subject. As a matter of fact we happen to have one on an evaluation of the effects of acid rain on low conductivity headwater streams in Pennsylvania. These were stations selected much the way we selected our benchmark stations at where we were certain there were no impacts related to the activities of man. There was no acid mine drainage; there was no mining. They confirm the results that we see in our NASQAN Network, namely a decrease in acidity in headwater streams in Pennsylvania. We have conducted studies in the State of New York, totally independent of the NASQAN Network, for more than 15 years; the same results. Report titled, "Temporal Trends in Acidity of Precipitation in the Surface Waters of New York."

Mr. SCHEUER. Does that indicate that the situation in the Adirondack lakes is improving?

Mr. COHEN. In fact that is the case, slight improvements over a period of 15 years; that is correct.

The result of our snow survey that I mentioned. I incorrectly stated that those results were not published; they were published and we will provide them to the committee.

Mr. SCHEUER. Very good. Over what time would you say those reports would indicate that our Adirondack Lakes would once again be able to sustain fish life, perhaps bring back tourism?

Mr. COHEN. The data that we have and the ability to manipulate those data would not allow us to make those predictions, Mr. Chairman.

Mr. SCHEUER. How do we get the kind of data that would enable you to?

Mr. COHEN. To continue careful monitoring of the type that we are doing, of the type Mr. Lyon advocates, intensive river quality assessments, a mixture of fixed-station monitoring, aerial investigations, and observation. Long-term predictions in terms of these trends are very difficult and dangerous to make.

Mr. SCHEUER. In terms of public policymaking which is what we are here for, would you say that your data tell us that right now is not the time to spend tens or hundreds of billions of dollars or does it tell us that we should not do anything or does it tell us that reduction in polluting seems to produce a concomitant reduction in polluting effects and that therefore, while we should not do everything, maybe we can do something and maybe there is some basic level of cost-effective pollution controls that we ought to be thinking about that would enhance whatever minute progress we seem to be making.

Mr. COHEN. I would agree with your last statement.

Mr. SCHEUER. The last statement?

Mr. COHEN. Yes. Selected and careful efforts to reduce pollution simply because the opportunity to respond to the somewhat emotional perceptions of some people with expenditures of billions of dollars is something I think we ought to think very carefully about before we embark upon that course of action.

Mr. **Scheuer**. Well, we have been talking for a hell of a long time and have done doggone little.

The question is do we do anything at all?

Mr. **Cohen**. We are very pleased that very recent analyses of the data, very recent——

Mr. **Scheuer**. You can't even tell me looking ahead 10, 20, 30 years, whether our Adirondack Lakes will ever again be able to sustain fish life? I do not think you have a right to be too awfully impressed with yourself, if you don't mind my saying so.

Mr. **Cohen**. We are not impressed with ourselves. We are pleased with observations that come as somewhat of a surprise to us.

Mr. **Scheuer**. You are what?

Mr. **Cohen**. We are pleased with observations that come somewhat as a surprise to us. We had no way of knowing whether the data would indicate improvements, or a worsening situation, or a level situation. We think it is good news to the Nation to see these slight improvements.

Mr. **Scheuer**. These slight improvements that we just heard from Mr. Lyon might have come from a cessation of mining, from the cessation of the process of pouring pollutants into the air, right? And if you can't even tell me that extrapolating that rate of improvement that any time in the forseeable future we can expect to see our Adirondack Lakes come back to the point where they can sustain fish life, why wouldn't we want to do a little bit more of this process of reducing pollutants in the air?

Mr. **Cohen**. We may well do more.

Mr. **Scheuer**. OK. Why then can't you adduce information and give us some recommendations from the scientific community that would enable us to do something? You are condemning us for years to do nothing.

Mr. **Cohen**. Not at all.

Mr. **Scheuer**. We don't find that acceptable.

Mr. **Cohen**. Not at all. I agreed with your statement which indicated careful and deliberate efforts to improve the environment.

Mr. **Scheuer**. What does that mean in the King's English? What would you advise us right here to do, to cut down further on the emission of pollutants in the Ohio River Valley, perhaps, what would you have us ask those smoke stack industries to do that would be clearly cost-effective, not be silly, not unnecessarily burden them?

Mr. **Cohen**. There is an area in which I have no personal experience or expertise, Mr. Chairman.

Mr. **Scheuer**. All right. Why don't you return to the witness table and we will go on with some of the questions.

Off the record.

[Discussion off the record.]

Mr. **Scheuer**. Can I ask all of the witnesses, there has been a great deal of talk this afternoon about the disarray and the lack of coordination in the national environmental monitoring program. How would you solve that problem of noncoordination and disarray? Would you create a new agency at the summit to provide some overview to provide some coordination or would you pick one of the existing agencies to be the lead agency?

Mr. Lyon.

Mr. LYON. Mr. Chairman, I do not think that it may be—it probably will not be necessary in my opinion to create a new agency. It may be quite possible that if the kind of commission that I recommended gets together and establishes some criteria for a unit of government to do this, that it may be possible that an existing agency could take on this job. I really would feel that it would be presumptuous for me at this time to suggest a specific agency or new agency. I think we need to establish some criteria for that purpose.

Mr. SCHEUER. What are the criteria?

Mr. LYON. I think one of the criteria has to be some degree of independence from the task of abating pollution, for example, or managing resources. There has to be some degree of independence.

Mr. SCHEUER. Some degree of what?

Mr. LYON. Independence.

Mr. SCHEUER. Yes.

Mr. LYON. Independence. I think another criterion should be that the people who make judgments and do analyses of these things should have strong scientific leadership that is respected throughout this nation.

I think another criterion should be that the agency, whichever agency takes this on, has available to it the information that is generated by the Federal agencies. Your dialog just now is very illustrative of the problem. The U.S. Geological Survey. [I want to correct for the record what I think was said incorrectly, I wasn't aware that the USGS baseline stations were measuring water quality in streams unaffected by mining. So, my supposition about mining is not correct. They obviously are measuring what is happening to headwater streams from acid rain.] But this dialog you just had is typical of the problem we have in the Federal Government because USGS does not have, as far as I know, available to it the information that say EPA has about what is happening to sulfate emissions at our major power stations. They need that information before they can do the kind of forecasting that you are asking them to do.

I seriously doubt if the Administrator of EPA is going to want his program being analyzed in another agency. That is not the way things happen in the Federal Government. So, that is another criterion that I would establish for that agency, that they do have the power to get from the Federal Government and the States the information they need to help steer this program.

Mr. SCHEUER. Just to proceed a little bit further, Mr. Lyon, you mention in your testimony that the monitoring requirements, themselves, are highly fragmented at the Federal level and that this fragmentation is imposed upon the States. Can you elaborate on this a little bit and show exactly what impact this causes for the States, what problems it produces?

Mr. LYON. Yes, I would be happy to do that. I would like to use EPA as an example, not to say that they are the only problem but it is easy for me to do that because the data in that area are available.

You take, for example, the water quality program in EPA, it has one set of monitoring requirements which must be complied with by the State of Pennsylvania in order to satisfy EPA's monitoring requirements. In the air program the monitoring requirements are set up in a different way so that you cannot put them together in a single logical system. The drinking water requirements are different, again. So, we do not have the ability to put it all together and follow the path of pollutants throughout the environment.

For example, the geographic location requirements in the air program are quite different than those in the water program and different, again, than those in the drinking water program.

Another problem we have is in the water quality assurance program, not being coordinated with the hazardous waste area. Some parameters are required to use certain water quality assurance analyses, while in the water quality program a different kind of analysis is required. So, in order to measure the same chemical, our laboratory has to use two different forms of analysis because two different programs in EPA require two different approaches to that analysis for the same chemical.

Mr. SCHEUER. Well then what remedy would you suggest?

Mr. LYON. Well, I think basically what is needed is a great deal of consensus building, first, among Federal agencies, and second, between Federal and State agencies and this is why I recommended that a commission be established so that commission can annually pull together the people not only from the Federal agency but also from the States and local agencies and private enterprise so we can come to some agreement as to what the analytical methods should be, what the monitoring methods should be and so forth.

Mr. SCHEUER. Now commissions normally do reports and make recommendations. They don't normally operate programs.

Would this commission actually be the lead agency?

Mr. LYON. It could very well. It does not necessarily have to be. I think one would have to take a look at what is happening as a result of the commission's recommendations. I would like to give you, as I think I did in my longer written statement, an example.

In the 1950's we had the same kind of disarray in our health statistics. And the National Office of Health Statistics then in HEW brought together the same kind of an annual workshop, where local, State, and Federal people sat together around workshops and they set up criteria on how to describe a given kind of illness and how to enter data into a computer and today we have a very sound national health statistics system; where local, Federal, and State people pretty much use the same kind of information system. Of course, we have the national weather program, which is the same kind of a national approach rather than just a Federal approach to a system. There are many other examples of that kind of national monitoring.

Mr. **Scheuer.** All right. You have all been very patient and tolerant. We do have some more questions but in deference to the hour, we are going to submit them by mail and we will hold the record open for 10 or 12 days or 2 weeks to give you time to get your answers back.

I appreciate your fine testimony very much. You have all been very responsive and we will hereby adjourn the meeting.

[The prepared statement of Philip Cohen follows:]

115T139 [illegible]

Statement of Philip Cohen, Chief Hydrologist, United States Geological Survey,
before the Subcommittee on Natural Resources, Agriculture Research and
Environment, Committee on Science and Technology, U.S. House of Representatives

May 19, 1983

During the period since the Associate Chief Hydrologist testified before this Subcommittee on June 8, 1982, the U.S. Geological Survey (USGS) has continued to vigorously interpret the data from its water-quality monitoring networks, to conduct intensive interpretive studies of river quality, and to move its overall water-quality program in some new directions that will provide improved descriptions of the status of the Nation's surface waters and ground waters. Today, I will present new results from our monitoring networks and describe new program thrusts in water quality. I will also draw upon the presented information to evaluate the extent to which our existing monitoring networks meet defined national purposes for water-quality information. To begin, I will briefly describe the USGS water-quality program.

THE WATER-QUALITY COMPONENT OF THE USGS WATER-RESOURCES PROGRAM

The U.S. Geological Survey is a non-regulatory agency having the broad mission of describing the Nation's mineral resources.

Within USGS, the specific mission of the water-resources program is to provide the hydrologic information and understanding needed for the best use and management of the Nation's water resources. To accomplish this mission, the Survey's Water Resources Division, in cooperation with State, local, and Federal agencies--

- Collects data on a systematic basis to determine the quantity, quality, and use of the Nation's surface and ground water.

- Conducts interpretive water-resource appraisals to predict the consequences of alternative plans for developing land and water resources.
- Conducts supportive basic and problem-oriented research in hydraulics, hydrology, and related fields.
- Coordinates water-data acquisition activities of all Federal agencies.

The water-quality program of the USGS consists of three major elements: (1) collection of basic data to describe the quality of surface and ground water, (2) research to increase knowledge of the processes which create the natural quality of water and which control the nature and rate of changes in water quality that result from anthropogenic point and nonpoint sources, and (3) applied interpretive studies to determine the causes of specific observed changes in water quality.

USGS collects a significant part of the Nation's water-quality data. In Fiscal Year (FY) 1983, USGS will collect water-quality data at more than 9,000 surface-water stations and from over 8,000 ground-water wells.

Within USGS, water quality comprises a major part of the water-resource program. For example, in FY 1983, more than half of the water projects conducted by the Survey contain a water-quality component. Another way of emphasizing the importance of water-quality studies is that, in FY 1983, water-quality investigations amount to nearly $90 million, or 45 percent, of the total funding of approximately $200 million for the Survey's water program.

THE USGS WATER QUALITY NETWORKS

The USGS operates two nationwide multipurpose networks to monitor surface-water quality--the National Hydrologic Benchmark Network and the National Stream Quality Accounting Network (NASQAN).

The Benchmark network is composed of 52 small drainage basins which are in a nearly natural state, with little human influence and little likelihood of future development. Study of these basins, which encompass a wide variety of natural environments, is helping to explain how much of the variation in water quality and quantity in streams across the Nation is natural and how much is caused by human activity. Funding for the water quality part of this network in FY 1983 is $660,000.

The NASQAN network, with 504 operating stations, provides a nationally consistent basis for continuously assessing the quality of major U.S. rivers. Stations are located to measure outflow from 331 accounting units (subregional drainage basins) which, collectively, encompass nearly the entire land surface of the Nation. The NASQAN network was initiated in FY 1973 with 50 stations and was implemented gradually to reach the full operating level in FY 1979. In FY 1983, Federal Program funding for the water quality part of the NASQAN network totals $4.4 million. Funding for the measurement of streamflow at NASQAN stations comes from a number of sources, including the Federal Program, the Federal-State Cooperative Program, and other Federal agencies.

Data collected in the Benchmark and NASQAN networks include streamflow, concentrations of major inorganic and trace constituents (including toxic metals), bacterial indicators of pollution, and concentrations of a limited number of radiochemical constituents.

The Benchmark program is designed to answer the question, "What is the hydrology and water quality in small basins which are in a near-natural state, with little or no change in land use? The NASQAN program, on the other hand, is designed to answer the question, "What is the quality of water in the major rivers of the United States?"

A major related purpose of both networks is to detect trends in the concentrations of significant constituents of water quality, though it is important to note that neither network was specifically designed to determine why water quality might be changing. Especially difficult in analyzing data from these networks has been the problem of separating human induced changes in water quality from the natural variability in quality that results from the changing seasons and differences between wet and dry years. However, USGS scientists have recently developed and reported upon special statistical techniques for detecting time trends in fixed-station water-quality data, and the techniques have proven successful for analyses of the constituents measured at the Benchmark and NASQAN stations.

Investigation of Acid Precipitation Induced Trends at Benchmark Stations

The Hydrologic Benchmark Network was established to help define hydrologic conditions in a variety of natural and near natural environments. Records from the Benchmark network are particularly appropriate for investigating atmospheric influences on water quality during the last decade because consistent sampling and analytical methods have been applied for a 15-year period at each station, and because minimal land use changes have occurred in the basins. USGS scientists have applied the recently developed trend detection tests to monthly records of acid-precipitation indicators at the Benchmark stations. Figures 1 and 2 show the locations and directions of detected trends in the flow-adjusted concentrations of sulfate and alkalinity. An upward-pointing arrow indicates an upward trend in concentration, a downward-pointing arrow signifies a downward trend, and a black dot means no detectable trend.

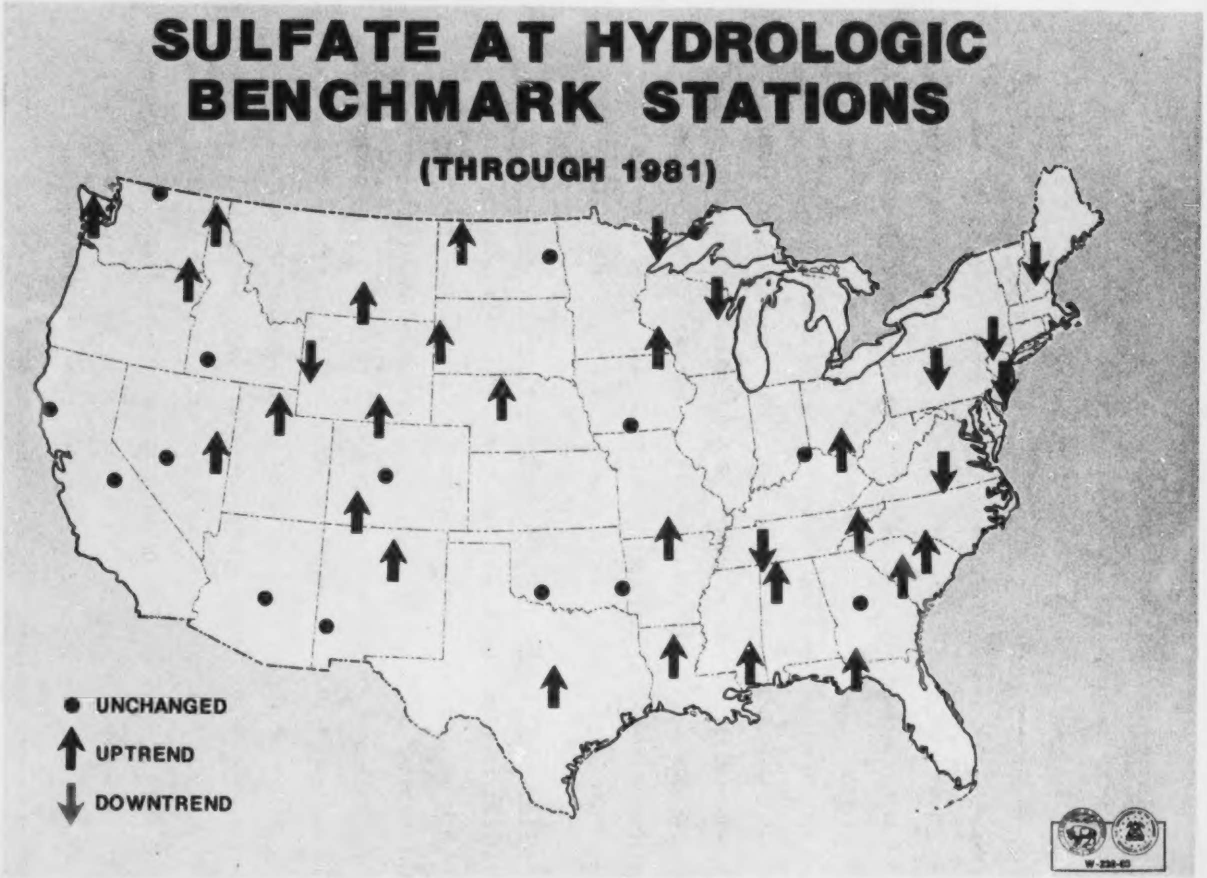
SULFATE AT HYDROLOGIC BENCHMARK STATIONS
(THROUGH 1981)
● UNCHANGED
↑ UPTREND
↓ DOWNTREND
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Figure 1.--Trends in flow adjusted sulfate concentrations at Benchmark stations, 1963-68 through 1981

ALKALINITY AT HYDROLOGIC BENCHMARK STATIONS

(THROUGH 1981)

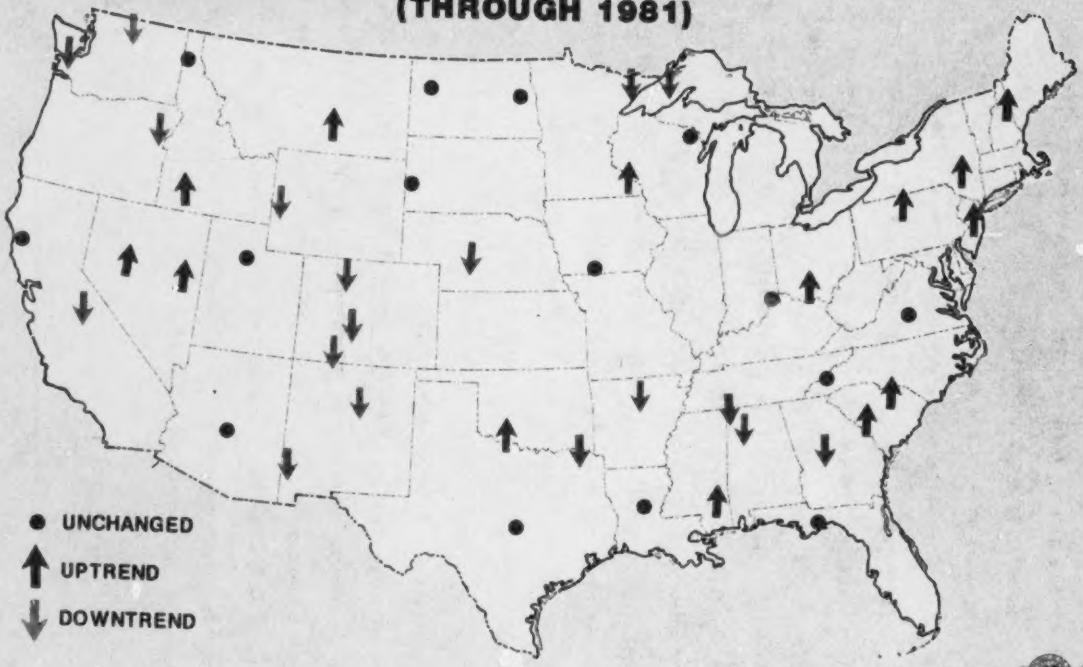

● UNCHANGED
UPTREND
DOWNTREND

Figure 2.--Trends in flow adjusted alkalinity concentrations at Benchmark stations, 1963-68 through 1981

Increased sulfate concentrations in water could result from increased industrial emissions of sulfur dioxide with subsequent atmospheric transport and conversion to dilute sulfuric acid. Thus, trends in sulfate concentration would tend to be up in areas increasingly affected by acid precipitation and down in areas where effects are abating. In contrast, alkalinity is a measure of the capability of water to neutralize acid, and is, itself, reduced by the neutralization process. Hence, acid inputs would be expected to decrease alkalinity, especially where the initial concentration is low, as is typical in regions devoid of certain rock types, such as limestone and marble.

Figure 1 shows that sulfate concentrations have tended to increase during the period of record at Benchmark stations over a broad area of the Continental United States extending from the Southeast to the Mountain States and the Northwest. In contrast, stations in the northeastern quarter of the Nation show either no trend or declines in sulfate concentrations. The statistical significance of the trends exceeds 80 percent at all sites noted with an arrow, and exceeds 99 percent at most of these sites. Most detected rates of change (not shown) are small. However, the measured stream sulfate concentrations at most Benchmark stations are low enough to be significantly influenced by changes in precipitation quality. Moreover, there is reported evidence that trends in sulfur dioxide emissions to the atmosphere during the 1970's followed a geographical pattern similar to that of the trends in Figure 1. Emissions have declined substantially in the Northeast and northern Midwest and increased in the Southeast and in States as far west as Iowa, Missouri, Arkansas, and Texas--the present geographical limit of reported emission data.

Figure 2 shows that trends in alkalinity at Benchmark stations are inversely related to sulfate trends over most of the country. Downward trends in alkalinity greatly outnumber upward trends within a broad area from the Southeast to the Northwest, whereas trends are consistently upward in the Northeast. Detailed analyses of the data indicate that the inverse relation of alkalinity to sulfate is somewhat stronger among stations with low average alkalinity.

Thus, the Benchmark network has provided the basis for the first long-term, national perspective of acid precipitation indicators in streams. In the Northeast, the observed patterns and associated data are consistent with a picture of slightly decreased concentrations of sulfuric acid in precipitation and a resulting slight recovery of buffering capacity in streams. In the western, central, and southeastern parts of the country, the patterns are consistent with slightly increased concentrations of acid in precipitation and a resulting slight loss of stream buffering capacity. USGS is conducting more detailed analyses of these and associated relationships.

Trends at NASQAN Stations

Most NASQAN stations are located on large rivers to measure the quantity and quality of water moving from one major drainage basin to another. NASQAN data thus provide a regional and national picture of water quality in the major rivers of the country. About 55 water-quality constituents are measured for each NASQAN station, and, at present, sufficient lengths of record exist to support the testing of trends for 35 constituents. In last year's testimony, we reported on the trends in phosphorus concentrations at NASQAN stations. This year, I will briefly describe new results on trend analyses of fecal streptococci, Kjeldahl-nitrogen, and chromium.

Figure 3 shows the results of trend analyses on fecal streptococci--a group of bacteria which are indigenous only to the digestive tract of humans and other warmblooded animals. Possible large sources of fecal streptococci to the environment include raw sewage, sewage treatment plant effluents, combined sewer overflows, and livestock feedlots. Significant trends are evident at 51 of the 261 NASQAN stations having a sufficient record length for analyses. All 51 trends are downward. The downtrends are so widespread that we initially thought they might represent a change in the method of analyzing for fecal streptococci. However, investigation of the history of fecal streptococci analyses by USGS indicates the data are sound and the trends, therefore, are real.

We first thought that the downtrends might reflect increases in the treatment of combined-sewer overflows. However, data from the Environmental Protection Agency's sewer grant "Needs Survey" indicate that significant improvements in the combined sewer overflow problem have yet to occur. In some urban areas, the downtrends possibly may reflect the upgrading of wastewater treatment plants which accelerated in the mid-1970's. At present we are testing this hypothesis with data from the Needs Survey.

Probably the most important factor in the observed downtrends of fecal streptococci has been a cleanup of agricultural runoff, especially feedlot runoff. During the mid- to late 1970's, EPA reduced the minimum size of animal holding operations which are required to meet pollution control regulations. As a result, there was a marked increase in the number of operations which now must control their effluents. Also, during the same period, dramatic changes took place in livestock populations as a result of changing market conditions. Most notable was the widespread reduction in beef cattle. Between 1974-1978, there was a net decrease of more than six million beef cows in the United States.

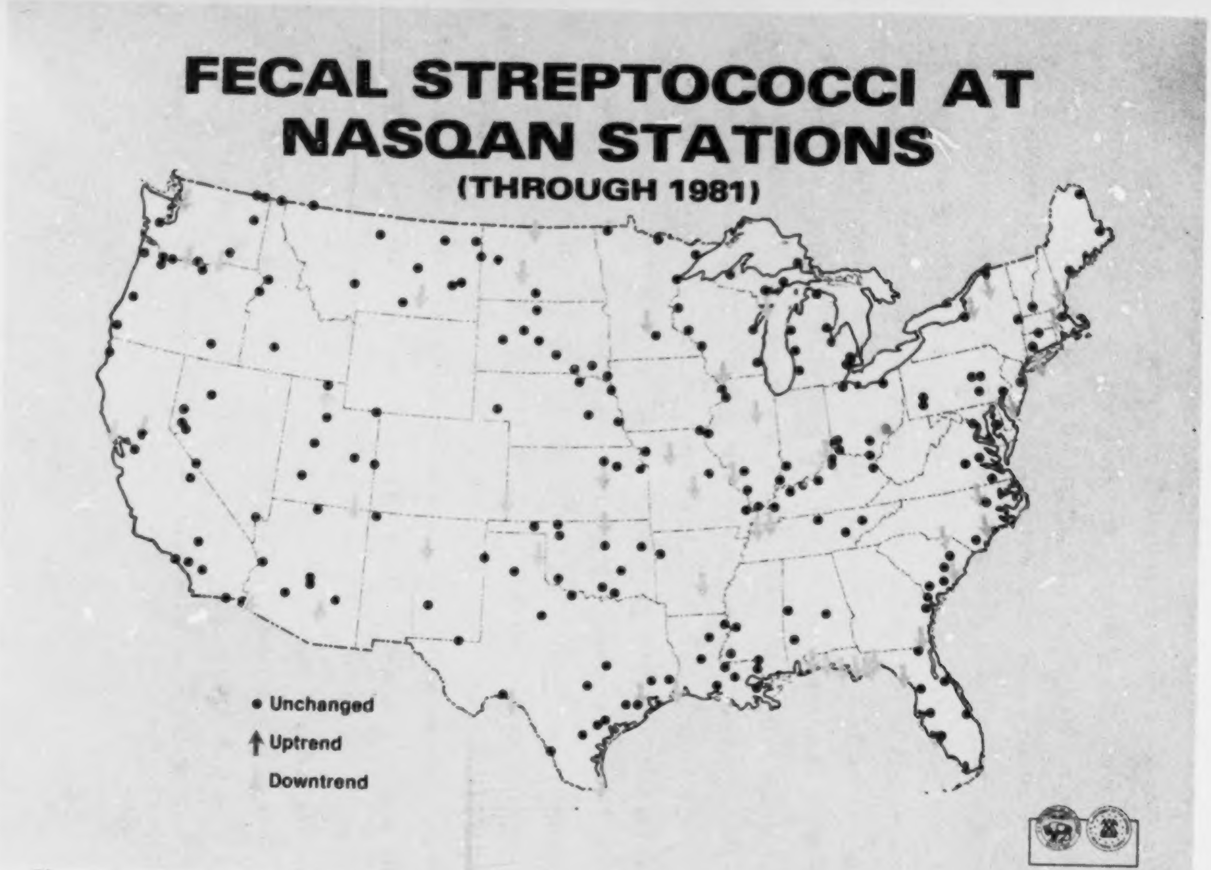

FECAL STREPTOCOCCI AT NASQAN STATIONS
(THROUGH 1981)
● Unchanged
↑ Uptrend
Downtrend

Figure 3.--Trends in flow adjusted fecal streptococci levels at NASQAN stations, 1974 through 1981

Figure 4 shows the NASQAN trend analysis for Kjeldahl nitrogen, which measures both the organic and ammonia forms of nitrogen. This figure portrays the most dramatic and widespread trend we have seen among all of the NASQAN constituents. One-third of all stations, and one-half of western stations, show significant uptrends with virtually no downtrends. This finding was so unexpected that it again prompted an investigation of sampling, preservation, and analytical methods to determine whether the data were affected by changes in technique. Detailed analysis of the records show two distinct periods of change in the data--one in 1976, especially prominent at eastern stations, and one during 1979-1980, especially prominent among western stations. The increases beginning in 1979 are the cause of most of the upward trends reported in Figure 4.

Investigation indicates that no change in laboratory technique was made in 1979, but that a small change in technique was made in 1976, which was not expected to influence the consistency of data. To test whether the observed trends did, in fact, result from the technique change in 1976 or from another cause, we are now investigating data collected by State and local agencies to determine if parallel increases in Kjeldahl nitrogen are detectable.

In investigating other possible causes, we have found changes in fertilizer practice which may explain the observed increases in Kjeldahl nitrogen. Available data on nationwide use of nitrogen fertilizers show modest but consistent increases in tons applied during the 1970's. Also, some changes in practice might have led to more nitrogen in runoff. The question is why would the increase be so large in 1979-1980? One possibility may be that the extremely hot and dry summers of 1979 and 1980 (especially in the West) resulted in a large loss of windblown soil from fields, much of which later entered the river systems.

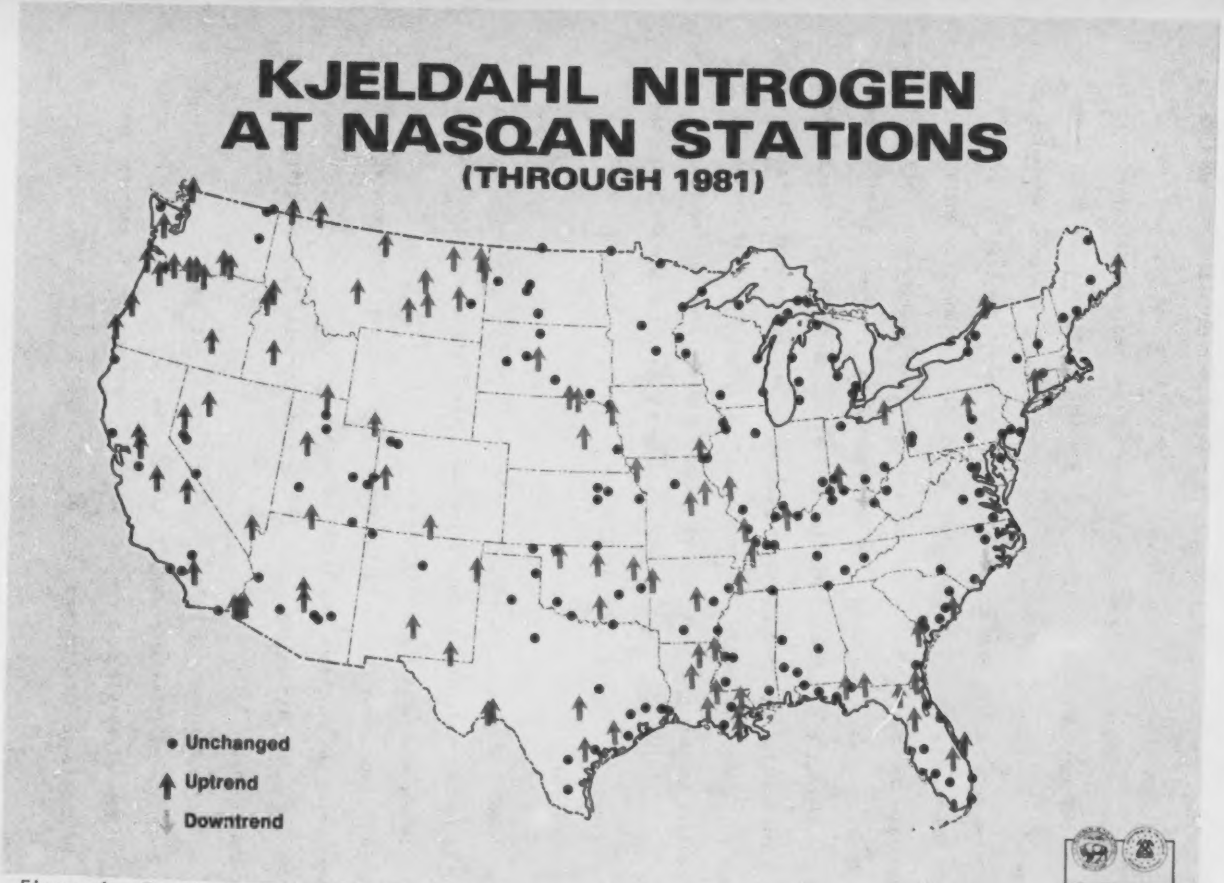

KJELDAHL NITROGEN
AT NASQAN STATIONS
(THROUGH 1981)
● Unchanged
↑ Uptrend
↓ Downtrend

Figure 4.--Trends in flow adjusted Kjeldahl-nitrogen concentrations at NASQAN stations, 1974 through 1981

In our testimony here on June 8th of last year, we presented a map showing the location of stations at which chromium concentrations have exceeded the drinking water standard in more than 10 percent of the samples. All sites exhibiting the high chromium levels occur in western basins, most of which have known natural deposits of chromium. In the period since last year's testimony, the chromium data records have become sufficient to permit the testing for trends. The results (Figure 5) show that, since 1975, chromium concentrations have undergone an upward trend at 30 stations. It is noteworthy that only 2 of these 30 stations are among those stations reported in last year's testimony as having the highest chromium concentrations. Instead, most of the stations which show chromium uptrends during the seven-year period are in the eastern half of the country, especially in the Ohio and upper Mississippi River basins, and, specifically, in some of the most heavily industrialized areas of the Nation. We are now compiling data on chromium discharges to water for comparison to the observed trends, and possibly for linking these trends to the major industrial uses of chromium.

WHAT PURPOSES DO THE BENCHMARK AND NASQAN NETWORKS FULFILL?

I began this testimony by describing the preliminary interpretation of fixed station, water-quality monitoring data collected in the USGS Benchmark and NASQAN networks. With this background, I will now review the general purposes which the Benchmark and NASQAN networks fulfill.

The following list includes most of the broad purposes for collecting water-quality data:

- Define near-natural baseline conditions.
- Define existing water-quality conditions.
- Detect trends and, therefore, possible improvements and emerging problems.
- Compute the transported loads of constituents of concern.

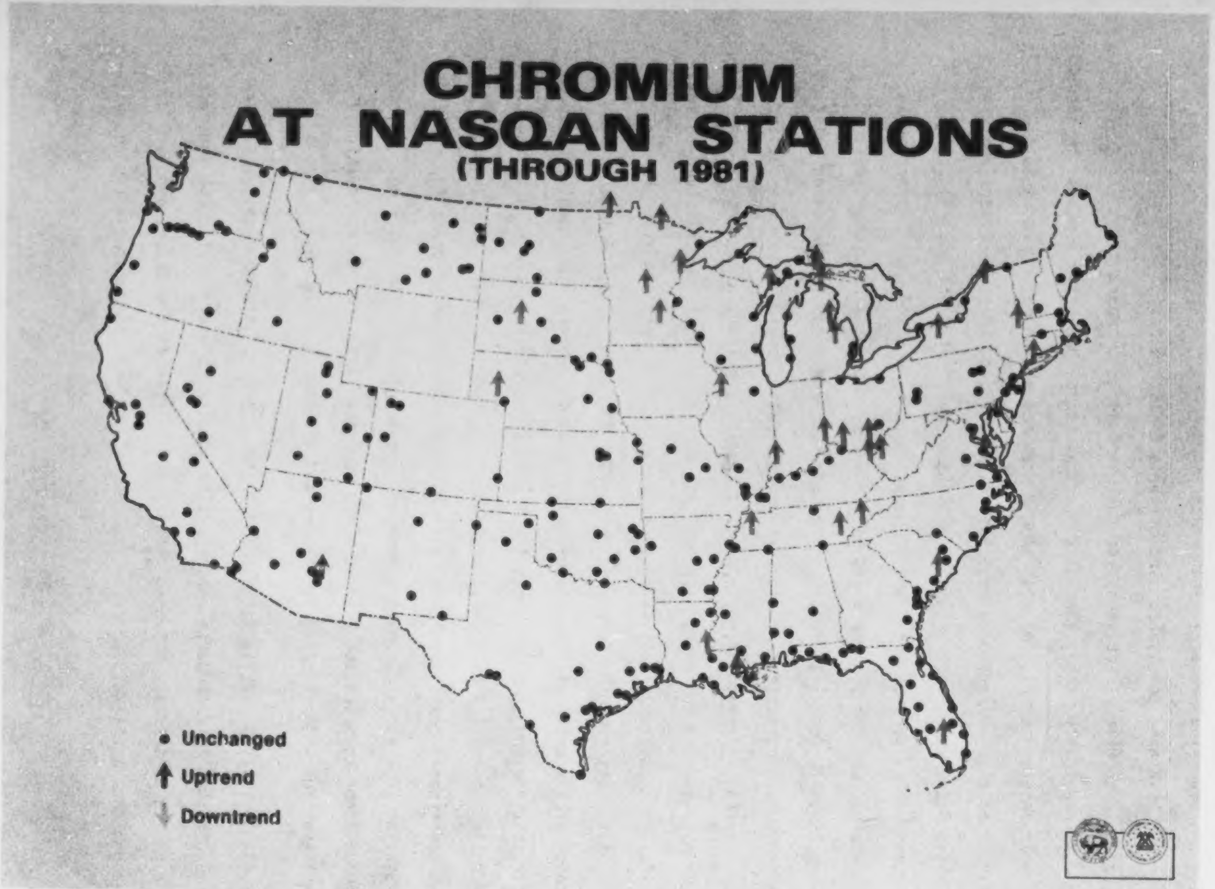

CHROMIUM
AT NASQAN STATIONS
(THROUGH 1981)
● Unchanged
↑ Uptrend
↓ Downtrend

Figure 5.--Trends in flow adjusted total chromium concentrations at NASQAN stations, 1975 through 1981

- Determine suitability for major uses.
- Determine compliance with criteria and standards.
- Determine effectiveness of pollution-control programs.

As previously noted, Benchmark stations are on headwater streams, in natural or near-natural basins, and most NASQAN stations are on major rivers at the downstream ends of large drainage basins. Therefore, the USGS Federal Water-Quality Networks do not include a complete array of stations covering all stream orders, stream sizes, and homogeneous units of land use. Nevertheless, in combination, the Benchmark and NASQAN networks provide consistent data bases suitable for: (1) defining near-natural baselines, (2) defining existing water-quality conditions at sites which integrate flow in large river basins, (3) detecting trends, and (4) computing transported loads of important constituents such as suspended sediment, nitrogen, phosphorus, carbon, and dissolved solids. By fully or partially fulfilling these purposes, the networks also provide some information on the suitability of water for major uses. However, the design of the networks limits their usefulness for determining compliance with criteria and standards, and for directly ascertaining the effectiveness of pollution-control programs. Because of its non-regulatory mission, USGS has never specifically designed water-quality networks or programs for meeting these two regulatory purposes. However, the programs which I will now describe are designed to elucidate water-quality processes and, therefore, are highly pertinent for understanding the causes and effects of pollution.

INTENSIVE RIVER-QUALITY ASSESSMENTS IN THE FEDERAL-STATE COOPERATIVE PROGRAM

USGS has long conducted interpretive studies of water quality to determine the causes of specific observed changes and to predict the nature and rate of changes that are likely to occur from use of surface- and ground-water resources.

USGS uses this approach, rather than fixed-station monitoring, to evaluate the benefits or degradation likely to result from pollution-control programs or increased discharge of wastes. Between 1973-1981, USGS accelerated such work by conducting a pilot program of seven intensive, cause-effect interpretive studies of river quality. We reported in last year's testimony on the pilot program and, specifically, on the results of the Willamette River Quality Assessment Study. The analytical approaches and methodologies developed in the pilot program are now extensively used in the Federal-State Cooperative Program of USGS. In FY 1982, 33 intensive studies were conducted as part of the Cooperative Program. Following is a sample of river-quality assessments in progress during FY 1983:

- "Water-Quality Assessment of the Souris River within North Dakota"--to assess cause-and-effect relations between domestic sewage discharges and river-water quality for a reach of the Souris River just upstream from important marsh habitats which are managed for waterfowl production.
- "Jordan River Quality Study, Utah"--to study and evaluate the causes and extent of key water-quality problems in a 40-mile reach of the river near Salt Lake City. Key problems being investigated, as identified in cooperation with local officials, are dissolved-oxygen depletion, pathogens, turbidity, and toxic substances.
- "Water Quality Assessment of the White River, Indiana"--to determine the effect of new advanced treatment of municipal wastewater on dissolved oxygen in the White River downstream from Indianapolis.
- "Assessment of Nonpoint Sources of Pollutants for the Conestoga River, Pennsylvania" --to evaluate, over a ten-year period, the effects on water quality of Best Management Practices implemented in agricultural areas. Key pollutants being studied in both the river and adjacent ground waters include nitrate and pesticides.

EVOLVING ELEMENTS OF THE USGS WATER-QUALITY PROGRAM

Neither standard, fixed-station monitoring nor intensive river-quality assessments can answer all of the important questions concerning surface- and ground-water quality. New types of problems require new types of data, and sometimes new approaches for collecting the data. In this context, I will briefly describe two evolving elements of the USGS program designed to obtain better data for describing the surface- and ground-water quality of the Nation.

Utility of NASQAN Stations for Local Environmental Assessments

The underlying purpose for describing areal differences in water quality is to identify problem areas that need special emphasis in study, planning, and management. The placement of NASQAN stations at or near the terminus of large drainage basins provides a regional and national picture of water quality, but it does not provide a consistent depiction of the water quality of local river reaches within the drainage basin. Now that standard statistical summaries and sophisticated trend analysis techniques are routinely characterizing water-quality conditions at NASQAN stations, USGS is able to begin examining this information for potential utility in local environmental assessments. It is now possible to determine the relationship of NASQAN data to: (1) data collected at other sites within the basin by USGS or other agencies, and (2) major anthropogenic factors which affect water quality, such as land use and pollution loadings.

With these thoughts in mind, the Geological Survey recently initiated a pilot series of eight interpretive studies at the State level. The objective of these studies is to compare the water quality in specific reaches within the drainage basin to the net water quality observed at the NASQAN station. This is being accomplished by compiling and interpreting water-quality data from other suitable long-term, fixed stations in each basin, plus selected correlative information on geology, hydrology, soils, population, land use, and point sources of pollution. In addition, synoptic reconnaissance studies are being conducted to partially fill the data gaps that exist in certain river reaches. The combined results are being used to assess water-quality variability in each basin, and to determine what additional information is needed to more precisely characterize water quality for local, as well as for regional and national assessments.

Upon conclusion, each pilot study will provide the following:

- Descriptions and explanations of variations in water quality or transport by sub-basin within the NASQAN basin.
- Descriptions and explanations of the distribution of trends within the basin; for example, whether the trends are scattered or apply to large portions of the basin.
- Correlations of the variations and trends in water quality within the basin with similar characteristics at the NASQAN site.
- Recommendations for: (1) additional data-collection sites and parameter coverage, (2) synoptic reconnaissances, and/or (3) intensive river-quality assessments to provide a sound assessment of water quality within the basin.

The results of these studies could well lead to better coordination of local, State, and Federal water-quality monitoring efforts by more precisely defining the specific information needs of government agencies to meet various water-resources management responsibilities.

Approach for Obtaining a National Perspective on Ground-Water Quality

To this point in the testimony, I have emphasized surface-water quality issues, but I will now switch the focus to ground-water quality, a matter of growing concern to the Nation.

A significant body of information exists concerning the hydrogeologic setting and inorganic quality of many ground-water systems in the Nation. The information was developed by local, State, and Federal agencies, and by numerous studies performed as part of the Federal and Cooperative Programs of the Geological Survey.

Recent studies by USGS confirmed that the available information can provide a general national picture of the inorganic quality of ground water, but only a crude and incomplete basis to judge man's effect on the quality of ground-water resources and the susceptibilty of ground water to contamination. Data on the occurrence and distribution of organic substances and trace metals are particularly lacking, and information on key chemical parameters, such as dissolved oxygen and microbial activity, is inadequate. Thus, no definition of a baseline for organics and trace metals is available, nor is there any way to make reasonable estimates of the extent of or trends in ground-water contamination from these substances. Consequently, only a few answers are available to the questions often asked--"How much or how badly are our ground waters contaminated?" and "Are they getting better or deteriorating?" At present, these questions can be answered only partially and indirectly--by extrapolating the impacts of landfills, or other point or nonpoint sources to a national scale, or by assuming that organic contamination can be understood through analogy to studies of inorganic pollution.

Clearly, there is critical need to accelerate the collection of ground-water quality information. However, evidence indicates that a standard monitoring approach will not work because: (1) ground-water velocities are usually very small, and (2) pollution of ground water tends to occur either in slowly developing pockets around point sources of contamination, or in shallow, slowly-expanding zones beneath areas of nonpoint pollution. Because of the nature of the emplacement process, the actual volumes of contaminated ground water tend to remain small for long periods of time in comparison to the total volume of ground water circulating through the earth. Thus, a monitoring strategy, in which samples are collected from observation wells chosen for areal coverage, would fail to detect most developing contamination problems until a great deal of damage had been done. Moreover, a simple monitoring effort, without prior analysis and interpretation, is virtually guaranteed to fail, if for no other reason than the directions of flow away from a contaminant source must be understood before an efficient monitoring program can be designed.

Over the past year, USGS has put its best ground-water scientists to the task of developing an approach for obtaining a national perspective on ground-water quality. The objective of the approach is to provide information on ambient ground-water quality with emphasis on organic substances and trace metals, so that the impact of human activities on ground water can be determined. The major aspects of the selected approach are:

- Representative areas of investigation will be selected based on climate, physiography, geohydrology, land use, and population. Typically, these areas will range from tens to hundreds of square miles, be of relatively uniform, well-defined hydrogeologic character, and contain one or more subareas where a single land use predominates. Land uses will include forest, agricultural, residential, and industrial.

- Design of the sampling network for each hydrogeologic area will be based on the hydrogeologic setting, ground-water flow conditions, and land use. Most samples will be collected from shallow aquifers--the systems most susceptible to surface sources of contamination.
- Interpretations will be made concerning the current state of the shallow aquifer systems underlying the different land uses. In conjunction with ground-water models, interpretations will be made of sources of organic and trace metal contaminants, the surface and subsurface avenues of contaminant migration, and the factors affecting contaminant concentrations.
- Additional, periodic sampling will be planned at intervals ranging from one to a few years, depending on the system, to help establish trends and a long-term data base for interpretation in future decades.
- Studies will probably be one to two years in duration. As studies end, new ones will begin. Over a period of years a national picture of ground-water quality will emerge for different mixes of physiographic regions, geohydrologic conditions, land uses, population densities, and specific major sources and types of contaminants.

USGS APPRAISAL OF THE GAO REPORT "BETTER MONITORING TECHNIQUES ARE NEEDED TO ASSESS THE QUALITY OF RIVERS AND STREAMS"

The GAO report recommends the discontinuance of fixed-station water-quality monitoring including the USGS NASQAN and EPA networks. The GAO's primary argument is that water-quality phenomena are too complex and variable, in space and in time, to be adequately characterized by monthly samples collected at a widely scattered set of sampling locations. The GAO further recommends that the NASQAN funding be used for additional problem-oriented studies such as a federally funded program of Intensive River-Quality Assessments. The Geological Survey agrees with the GAO concerning the value of intensive studies and, as noted, includes them as a major component of its program. However, these studies are short term and problem specific and do not lend themselves to national assessments of surface-water quality because they are not evenly distributed geographically or continuous in time. Thus, although special studies are a vital part of surface-water quality assessment, they do not provide national-scale descriptions.

The objective of NASQAN is to provide a regional and nationwide overview of the quality of major rivers, from which geographic and temporal variability can be inferred. Only by regularly monitoring water quality and quantity and by measuring chemical, physical, and biological characteristics of the water over all the seasons at a number of fixed sites, is it possible to infer how these characteristics vary over the years and with the seasons, flow, and other variables. In this defined context, one can make statistically supportable statements that subsequent measurements of water-quality characteristics do, or do not, represent a change from the past. Because of this capability, fixed station, long-term networks provide a powerful means to identify regional and national changes in water quality and emerging water-quality problems.

In summary, our differences with the GAO are as follows:

- Special problem-oriented water-quality studies are not an alternative for national networks, as the GAO suggests, but satisfy a separate complementary function. Both approaches to water-quality appraisal are needed to fulfill the USGS mission of providing the hydrologic information and understanding needed for the best use and management of the Nation's water resources.
- To perform national comparisons of surface-water quality, one must have nationally consistent (time, place, kind, and quality) data, and this feasibly can be obtained only from national networks.

RECOMMENDATIONS FOR IMPROVEMENTS IN WATER-QUALITY MONITORING

As reported, the USGS is investigating new approaches for improving the monitoring and overall study of both surface- and ground-water quality. USGS believes that the NASQAN and Benchmark networks, in combination with the detailed water-quality monitoring and intensive interpretative studies in our Federal-State Cooperative Program, provide a sound foundation for measuring surface-water quality throughout the country. In a similar manner, our existing ground-water data programs and interpretative studies, together with the new thrust in trace organic and trace metal studies, provide a basis for depicting the ground-water quality of the country. By pursuing our existing program, by adding new program elements such as those discussed here, and by coordinating our efforts with EPA's monitoring programs and Aquatic Life Survey, we believe that a viable system for assessing the water quality of the Nation for all major purposes is coming into place. We, therefore, make no specific recommendation at this time, but would be pleased to re-evaluate this issue in 1984.

[Whereupon at 3:50 p.m. the subcommittee adjourned to reconvene subject to the call of the Chair.]

NATIONAL ENVIRONMENTAL MONITORING

THURSDAY, MAY 26, 1983

House of Representatives,
Committee on Science and Technology,
Subcommittee on Natural Resources,
Agriculture Research and Environment,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:33 a.m., in room 2325, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Present: Representatives Scheuer, McGrath, and Schneider.

Staff present: James Harrison, staff assistant, and Mary Beth McJury, minority technical consultant.

Mr. **Scheuer**. This hearing of the Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

We delayed somewhat because we thought there was going to be a vote, a second vote, on the MX missile early this morning, but it has not taken place yet. Therefore, we are going to begin. When it does happen, we will have to adjourn for 10 or 12 minutes, which we had hoped to avoid.

We have excellent attendance here on the part of my minority colleagues. We are joined by Congressman Ray McGrath of the great State of New York and Congresswoman Claudine Schneider of the great State of Rhode Island. Her very distinguished husband, one of the great environmentalists in our country, is out in the audience. We are very, very happy to welcome him here.

We are going to continue, of course, our hearings on environmental monitoring. We are going to break up our witnesses into two groups. The first group will be State and regional witnesses, one from the Ohio River Valley Water Sanitation Commission and the other from the California Air Resources Board. The last three witnesses, who will constitute the second panel, will be representing Federal agencies or federally funded activities.

We are holding these hearings because of our concern about the condition of the Nation's environmental monitoring programs, programs of course which are essential both for enforcing existing environmental statutes and for detecting future environmental problems. Our objectives are to identify problems and to make recommendations that will lead to improvements in environmental monitoring.

Last week we heard from representatives of the EPA and the U.S. Geological Survey concerning their problems in air and water quality monitoring. We also heard from witnesses from the private sector who related problems in environmental monitoring and made some suggestions as to how we could improve our monitoring systems.

One of those suggestions calls for the establishment of a commission to recommend to the Congress and to the President the plan for creating a national environmental monitoring program. The commission would include appointees from the executive branch; Congress; State and local governments; interstate commissions; industry; environmental, conservation, and health groups; and from science and academic experts.

The plan would include institutional, organizational, budgetary, scientific, and legislative elements as well as a statement of goals and objectives for the national environmental monitoring program.

We would also hope at some point in time to look beyond the national environmental monitoring program to a global environmental monitoring program. In fact, we had breakfast this morning with one of the distinguished witnesses whom we enjoyed hearing from last week. We would hope to do this on a very cost-effective basis with a great deal of voluntary contributions by States, by governments, by private corporations like airlines and shipping companies. We were told a year or more ago that Pan American Airways always has six planes in the air doing environmental monitoring and reporting back to Washington. We would hope other national airlines and shipping companies, both freight and passenger ships, to be part of a web, of a network, that would span the world and that would be constantly reporting into a central reporting nerve center, let us say, at very, very little cost to our Government. This commission might very well look into that.

The commission would also conduct annual workshops and bring together experts to develop a consensus about topics in environmental monitoring.

As I said before, today we will hear from the first panel from regional and State witnesses. The second panel will be Federal witnesses and the Woods Hole Oceanographic Institution on Cape Cod, with which many of you must be familiar.

I look forward to the testimony of today's witnesses so that we can continue to lay the foundation for improvements in our Nation's environmental monitoring programs.

Before we start, I would like to call upon my two very distinguished minority colleagues—first, Ray McGrath, the ranking minority member on this committee, a very forthcoming, hard-working, and contributing member of this subcommittee from the Long Island delegation.

Are you the dean of the Long Island delegation?

Mr. McGRATH. No.

Mr. SCHEUER. My senior colleague on the Long Island delegation.

Mr. McGRATH. I am going to remind you of those nice things that you said about me. I want a copy of the text so I can use it in the next campaign. [Laughter.]

I want to thank the chairman for those kind words.

I want to join in welcoming with him our witnesses this morning for the second of three hearings on national environmental monitoring.

I ask unanimous consent to insert into the record at this point my opening statement.

Mr. SCHEUER. All right.

[The prepared statement of Raymond McGrath follows:]

OPENING STATEMENT OF HON. RAYMOND J. MCGRATH, A REPRESENTATIVE FROM NEW YORK

Thank you, Mr. Chairman. I want to join you in welcoming our witnesses here this morning, for the second of three hearings on national environmental monitoring.

Environmental monitoring is essential to the implementation of all major environmental statutes and is a key to the detection of further problems.

The present U.S. environmental monitoring system is an ad hoc collection of diverse programs conducted by many agencies at different levels of government. The information we receive in these hearings will, I am sure, be quite valuable to the Subcommittee in determining the status of the monitoring programs and point to areas where better coordination and streamlining would result in an improved monitoring system.

I look forward to the testimony of the witnesses.

Mr. SCHEUER. Mrs. Schneider.

Mrs. SCHNEIDER. Thank you, Mr. Chairman.

I would like to welcome our witnesses here this morning.

This is the second of a series of hearings that we are holding on the whole issue of monitoring. I have stated my bias very early on. It is very difficult when we sit in this committee to decide whether or not the various regulatory agencies are making decisions based on good science unless we have the monitoring that is consistent and adequate enough to reinforce regulations that we are putting forward.

I look forward to solutions and answers today. I am looking forward to hearing the testimony.

Thank you, Mr. Chairman.

Mr. SCHEUER. All right. Let's have the first panel come to the table: Mr. Lloyd Clausing, chairman of the Ohio River Valley Water Sanitation Commission, and Mr. William Sylte, chief deputy executive officer of the California Air Resources Board.

Before you start, let me say that your full prepared statements will be printed in full in the record. Therefore, what we hope you will do is chat with us informally, take not more than 7 or 8 minutes, as controlled by our egg timer up here. Hit the highlights of your testimony, and then we will have plenty of time to ask you questions. OK?

STATEMENT OF LLOYD N. CLAUSING, CHAIRMAN, OHIO RIVER VALLEY WATER SANITATION COMMISSION, ACCOMPANIED BY LEO WEAVER, EXECUTIVE DIRECTOR AND CHIEF ENGINEER

Mr. CLAUSING. Fine.

My name is Lloyd Clausing; I am the chairman of the Ohio River Valley Water Sanitation Commission. Accompanying me is Mr. Leo Weaver, the commission's executive director and chief engineer.

Since I have been allotted 7 or 8 minutes, I am going to have to move quickly.

Mr. Chairman and members of the subcommittee, the systematic acquisition and assessment of information on water quality conditions were targeted as essential at the inception of this commission.

The quality of the Ohio River Valley waters is impacted by a wide variety of natural and man-made influences: Wastewater discharge from municipalities and industries, agricultural runoff and mine drainage are examples. A continuing assessment and diagnosis of river conditions is the basis for evaluating water quality and the ultimate measure of the effectiveness of the water pollution control program.

Regulatory actions follow directly from monitoring efforts as well. Monitoring programs provide the data necessary to gage the progress toward the attainment of established goals.

The commission initiated river monitoring in 1951 with the assistance of water utilities. Always concerned about upstream water quality, the utilities agreed to furnish results obtained from daily water testing to the commission.

It was soon recognized that although the data from the water utilities provided basic information, real-time data on certain additional water quality parameters were needed. This led to the development of an electronic monitoring system. Today we take robots and computers for granted, but in the late 1950's electronic monitoring was, indeed, a new development in the water pollution control field. Today there are 21 of these electronic monitors located on the Ohio River and major tributaries and they send real-time data.

In the late 1960's and early 1970's, intensified concerns about environmental protection resulted in the Federal Government taking a larger role in determining basic minimum levels of treatment and/or standards to be met by industries and municipalities discharging wastes to the air or water.

During this same period, Federal water quality monitoring through regular sampling and analysis was intensified by Federal and State agencies. As a result, by 1972 more than 120 sampling points existed on the Ohio River mainstream as the six States bordering the river, along with the U.S. Geological Survey, the Corps of Engineers, and the U.S. Environmental Protection Agency, all collected the data they needed. In many cases these sampling points were in close proximity to one another.

The duplication of effort was obvious as well as unnecessary. In 1973 the monitoring staffs of the eight member States, the USEPA, the USGS, and the U.S. Corps of Engineers developed through the commission a monitoring strategy for the Ohio River and lower reaches of major tributaries. In this, the delegation of manual sampling for "conventional" pollutants, such as nutrients, heavy metals, biochemical oxygen demand, et cetera, to the commission was proposed. With this came increased State support to the commission for monitoring. In return, the States experienced substantial savings in their overall monitoring programs because the commission was able to decrease the more than 120 stations to 37 and still meet the needs of the States and Federal agencies for information. The monitoring strategy of the commission is reviewed annually by the concerned agencies and a revised document was published in 1982.

In extending its activities in the monitoring of chemical and physical characteristics of river water, the commission did not neglect the biological aspects. Along with regular sampling for bacteriological organisms; namely, fecal coliform, the commission also coordinated annual surveys on fish populations.

With the cooperation of member States and Federal natural resources and environmental protection personnel, lock chambers of the Ohio River dams are sampled for fish species. The proportion of fish in sport, commercial, forage, and other categories is a clear indication of overall long-term trends in water quality. These surveys have been undertaken regularly since 1968. Fish have also been collected for chemical analysis for pesticides, PCB's, and heavy metals. The U.S. Food and Drug Administration performs these analyses for the commission.

During the winter of 1976–77, a series of spills of the organic chemical carbon tetrachloride made their way undetected from the Kanawha River in West Virginia into water supplies downstream along the Ohio. The public outcry that followed caused water pollution control agencies to reassess their programs and emphases.

Out of this was established the commission's Organics Detection System, ODS. Capable of identifying certain organic chemicals in concentrations as low as a fraction of a part per billion, the ODS has proved to be a deterrent to unreported spills and accidental discharges in the Ohio River Valley. It provides the needed "early warning" to water utilities so they can take measures to protect their supplies in the event of a spill. Ten stations are located at water utilities and two at strategically located industries. Much of the original equipment was purchased under a grant from the U.S. Environmental Protection Agency.

Currently, the ODS sites themselves bear one-half the cost of operating the system, primarily in terms of personnel costs. Approximately 35 percent is provided by the commission through its appropriations from member States. The remaining 15 percent comes from a grant from U.S. EPA under section 106 of the Clean Water Act.

The data from the various monitoring programs of the commission are compiled at commission headquarters, entered through computer terminals, and stored with the U.S. EPA's water quality database, STORET. Data are thus available to agencies and others with STORET access. In addition, regular commission publications provide summaries and analyses of the data.

Based upon the data and analysis of it, decisions are made that affect the river and the people who use it, both now and in the long term. During periods of low flow, especially in the summer months, the Corps of Engineers uses dissolved oxygen data recorded through the electronic monitoring system to make decisions regarding operations at the 18 high lift dams on the river. The dissolved oxygen data have also been used to determine the effects of hydropower operations during low flows. The owners of these facilities are being encouraged to install electronic monitors at their stations to enable the Corps of Engineers to scrutinize water quality conditions at those sites closely.

Data from monitoring also show that control programs have resulted in decreased industrial discharges of cyanide over the last 5 years, whereas phenolics, which can cause taste and odor problems in water supplies, remain a problem. The monitoring data on phenolics instigated intensive surveys on these compounds in 1983, coordinated by the commission and involving Ohio, Pennsylvania, West Virginia, and the U.S. EPA.

Mr. SCHEUER. Mr. Clausing, we are running a little over on time. I wonder if you could take a couple of minutes to summarize.

Mr. CLAUSING. I can make my conclusions then.

Conclusions and recommendations: A fundamental characteristic distinguishes the monitoring program of the commission. It is pursued on a problem shed basis. It is not limited by geographic boundaries which may or may not recognize the actual hydrologic systems.

What this means is that the commission's programs are developed from the ground up to meet specified needs—local needs. What this also means is that our programs are based upon the common denominator of water pollution problems—the river basin. This is a key factor as to why the commission's programs are successful and operate with such extensive cooperation. They are based upon identifying problems that are State and local concerns. Therefore, the necessary support in terms of work force, technical services, and funds are forthcoming.

Also, the commission's monitoring programs are flexible. Water quality conditions are dynamic. A problem a year ago could be under control the next year. The commission can shift its efforts and focus on new issues. When monitoring activities are mandated by statute or regulations, as they are in Federal programs, this flexibility is difficult to assure.

Recognize that the commission is concerned with only one river system, although it is a large system made up of many smaller systems. The organization may well bear closer scrutiny for application elsewhere. Moreover, using the river basin as the basic element in approaching water pollution has been supported and encouraged in professional circles for many years. Rivers do not recognize political boundaries, and neither does water pollution.

Thank you, Mr. Chairman and members of the subcommittee.

[The prepared statement of Lloyd N. Clausing follows:]

Testimony
given by
Lloyd N. Clausing, Chairman
Ohio River Valley Water Sanitation Commission

Mr. Chairman, members of the Subcommittee:

My name is Lloyd Clausing. I am the Chairman of the Ohio River Valley Water Sanitation Commission. Accompanying me is Leo Weaver, the Commission's Executive Director and Chief Engineer. We appreciate very much the committee's invitation to present a statement on the Commission's monitoring and surveillance program.

The Ohio River Valley Water Sanitation Compact

In 1948, eight states of the Ohio River Valley--Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia--entered into a Compact to control present and future water pollution in the Valley. The Compact itself is considered a covenant, founded on mutual trust and respectful of state identity and interstate diversity. The Compact was formed by the action of the eight state legislatures and ratified by the U.S. Congress. The Ohio River Valley Water Sanitation Commission (ORSANCO) has responsibility for implementing the Compact. The Commission has 27 members, three commissioners appointed by the Governor of each member state, and three commissioners appointed by the President to represent the Federal Government. Commissioners serve without compensation; their expenses for attending Commission meetings are reimbursed.

The Commission's basic funding is provided by appropriations from the member State Legislatures; the Commission receives a program grant under provisions of Section 106 of the Federal Water Pollution Control Act administered by the U.S. Environmental Protection Agency (US EPA). The Corps of Engineers contracts with the Commission to operate certain special purpose monitoring programs.

The streams of the Ohio River Valley Compact District drain an area of 155,000 square miles. The Compact District is about 700 miles long and about 220 miles wide. Population density ranges from more than 9,000 people per square mile in the east to less than 20 people per square mile in western rural areas.

Basin-Wide Monitoring Program

Provisions of the Compact and later action by the Commission and the Signatory States stipulate that the waters of the basin shall be of a quality suitable for use as public and industrial water supplies after reasonable treatment, suitable for recreational usage, capable of maintaining fish and other aquatic life and adaptable for other legitimate uses. The water quality information requirements of the several federal and state agencies as well as the many municipal and private corporations in the Valley determine several basic objectives of monitoring programs. These include: 1) providing information needed for use in operating water supply and wastewater treatment facilities; 2) determining whether wastewater discharges comply with effluent standards and do not impair stream quality conditions necessary to meet criteria of acceptability for designated uses; 3) establishing a basis for upgraded wastewater control requirements or other management procedures to produce desirable stream quality conditions; 4) measuring the effectiveness of pollution control and quality management methods; and 5) providing long term information to evaluate improvement or degradation of stream quality and to guide, when necessary, the establishment of criteria for additional water quality parameters.

Operating facilities. Included in this category are public and private treatment plants for domestic as well as industrial wastewater. The water quality information is used for prescribing appropriate levels of treatment to meet stream standards. Timely data may also be used in regulating reservoir releases to reduce negative impacts of uncontrolled sources of discharge such as drainage from abandoned mines.

Compliance. Monitoring for compliance with effluent standards set forth in discharge permits issued by the U. S. EPA and/or state regulatory agency is shared responsibility. Under terms of the normal permit, an industry or municipality is required to carry out certain prescribed monitoring on a scheduled basis. A report of the data obtained is required to be sent to the permit issuing regulatory agency. The federal/state regulatory agency in turn reviews this data for compliance but also periodically sends compliance monitoring teams to determine whether or not the discharge terms are in fact being respected. Permit issuance and compliance monitoring responsibilities are prescribed to the U. S. Environmental Protection Agency by the Federal Water Pollution Control Act but may be delegated to a state where certain requirements are met. This authority has been delegated to seven of the eight member states.

Ambient monitoring. Ambient monitoring refers to periodic samples taken from the stream at key points on a regularly scheduled basis. The schedule may vary from daily or weekly to quarterly or annually depending on the data bank already in hand, the significance and nature of the parameter being examined, and the character of the stream. In the Ohio Valley, the U. S. Environmental Protection Agency carries out a very limited program of specialized ambient monitoring; the U. S. Geological Survey operates several stations as part of its National Stream Quality Network; the Compact States have hundreds of sampling points in the tributary basins. Some of these are operated by contract with U. S. Geological Survey. The responsibility for ambient monitoring on the Ohio River mainstem and the lower reaches of the major tributaries is delegated by the states and federal agencies to ORSANCO.

THE OHIO RIVER

The confluence of the Allegheny and Monongahela rivers in Pittsburgh, Pennsylvania, creates the Ohio River. Serving the industrial heartland of America, the river meanders 981 miles southwesterly to Cairo, Illinois, where it joins the Mississippi River on its journey to the Gulf of Mexico (Fig. 1, see map, attached). Flood control and transportation have been key factors in the development of the river. The Valley contains more than 60 flood control reservoirs and the Ohio River by 1929 had been canalized throughout its entire course. Some of the tributaries are also canalized. There were 50 locks and dams in operation on the river system; at the completion of a modernization program now well advanced, 19 locks and dams will be in operation on the mainstem of the Ohio to maintain a nine foot channel depth. Barges pushed by towboats are a familiar sight on the Ohio. In 1981, 158 million tons were transported on the river. About two-thirds of freight traffic consists of bulk forms of energy-coal, crude oil and petroleum products. Other commodities include sand, gravel, steel, chemicals and grain.

The Ohio River region contains a diversity of heavy industry including steel making, paper making, metal working, machine tool fabrication, distilleries, food processing, petrochemical and aluminum manufacturing plants. Its abundant coal supply has given rise to a continually expanding power generation industry which includes some nuclear installations. The world's first full scale nuclear power plant devoted exclusively to civilian needs was built on the Ohio River at Shippingport, Pennsylvania in 1958. Presently 32 power facilities with some 32,000 MW generating capacity operate along the Ohio. An additional 13 are at various states of planning and construction, and three of these are nuclear. In the 1970's, the largest coal liquification plant in the U. S. was constructed and operated at Catlettsburg, Kentucky, which is at the confluence of a major tributary, the Big Sandy River, and the Ohio.

Flow characteristics

Generally, the river has a sandy, gravelly bottom. Velocities vary from less than one-half mile per hour to more than five miles per hour. Flow also varies markedly. The ten year, seven day critical low flow at Pittsburgh, Pennsylvania is 4,600 cfs. The average flow for the Ohio River at Pittsburgh in October, 1982 was 8,200 cfs. In February of that year, it was 60,000 cfs. At a point 30 miles above the mouth of the river, the average flows in October and February of 1982 were respectively 94,000 cfs and 630,000 cfs. It is not unusual for the flows of comparable months at the mouth to be ten to fifteen times greater than those at Pittsburgh.

THE ORSANCO MONITORING PROGRAM

Each component of the Commission's monitoring program is based on the cooperation and coordination of local, state and federal agencies. For example, the initial program, started in 1952, was based on the cooperation of managers of public and industrial water systems--the ORSANCO Water Users Committee--who have routinely provided data on quality of river water at plant intakes and have participated in regional research projects on evaluation and standardization of laboratory procedures. In many cases, these water utilities are locations where Commission Surveillance Specialists collect manual samples. Many of the utilities participate in other elements of the Commission's surveillance system, providing water supply, laboratory facilities and personnel. In varying ways, interagency relationships apply to each element of the monitoring activities conducted by the Commission.

Quality Assurance. Extensive quality assurance--constituting 15 to 20 percent of monitoring program resources--confirms the validity of the water quality and other data. This includes standardization of electronic monitor maintenance and calibration, standardization of sample collection, identification and shipping methods, specification of all laboratory procedures including instrument calibration, quality control samples and analyses of prepared standard samples. Water quality river cross section studies have been completed at sampling locations in the surveillance system to verify that the sample collection point accurately represents river quality.

Data acquisition. Details of the Commission's current monitoring program are summarized in Figure 2. The Electronic Monitors and Manual Sampling Program provide continuing assessments of river quality. Along with flow forecast data, this information is channeled to a central computer terminal system at the Commission's headquarters in Cincinnati, where it is processed for storage in the US EPA's water quality database, STORET. Retrievals from STORET are utilized for analysis and final publication. However, all data are available for staff review immediately upon receipt at headquarters; for example, each morning, a daily report is generated from the previous day's Electronic Monitor readings and flow forecasts.

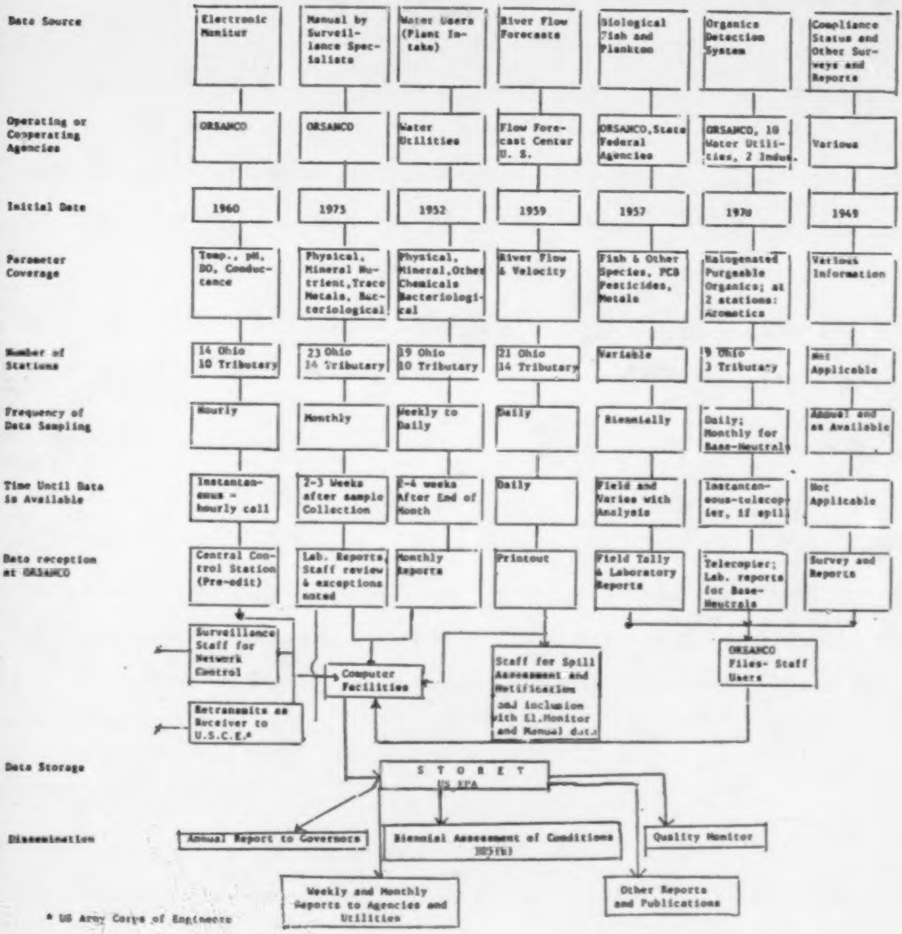
The last three columns of Figure 2 describe other elements of the Commission's monitoring program which warrant more extensive information.

Biological monitoring. Baseline studies of the aquatic life resources of the Ohio

Figure 2

ORSANCO MONITORING PROGRAM

Data Source and Initial Data Handling



Data Source	Electronic Monitor	Manual by Surveillance Specialists	Water Users (Plant Intake)	River Flow Forecasts	Biological Fish and Plankton	Organics Detection System	Compliance Status and Other Surveys and Reports
Operating or Cooperating Agencies	ORSANCO	ORSANCO	Water Utilities	Flow Forecast Center U. S.	ORSANCO, State Federal Agencies	ORSANCO, 10 Water Utilities, 2 Indus.	Various
Initial Date	1960	1975	1952	1959	1957	1970	1949
Parameter Coverage	Temp., pH, DO, Conductance	Physical, Mineral Nutrient, Trace Metals, Bacteriological	Physical, Mineral, Other Chemicals Bacteriological	River Flow & Velocity	Fish & Other Species, PCB Pesticides, Metals	Halogenated Purgeable Organics; at 2 stations: Aromatics	Various Information
Number of Stations	14 Ohio 10 Tributary	23 Ohio 14 Tributary	19 Ohio 10 Tributary	21 Ohio 14 Tributary	Variable	9 Ohio 3 Tributary	Not Applicable
Frequency of Data Sampling	Hourly	Monthly	Weekly to Daily	Daily	Biennially	Daily; Monthly for Base-Neutrals	Annual and as Available
Time Until Data is Available	Instantaneous - hourly call	2-3 Weeks after sample Collection	2-4 weeks After End of Month	Daily	Field and Varies with Analysis	Instantaneous-telecopier, if spill	Not Applicable
Data reception at ORSANCO	Central Control Station (Pre-edit)	Lab. Reports, Staff review & exceptions noted	Monthly Reports	Printout	Field Tally & Laboratory Reports	Telecopier; Lab. reports for Base-Neutrals	Survey and Reports

Surveillance Staff for Network Control
Retransmits as Receiver to U.S.C.E.*
Computer Facilities
Staff for Spill Assessment and Notification and inclusion with El.Monitor and Manual data
ORSANCO Files- Staff Users
Data Storage
S T O R E T
US EPA
Dissemination
Annual Report to Governors
Biennial Assessment of Conditions 305(b)
Quality Monitor
Weekly and Monthly Reports to Agencies and Utilities
Other Reports and Publications

* US Army Corps of Engineers

River were performed from 1957 through 1960. This was a cooperative program of state and federal agencies coordinated and participated in by Commission staff. Fish species enumeration (number and size) studies using rotenone in the US Corps of Engineers' navigation lock chambers for sample collection were conducted in 1967, 1968 and 1969. These were repeated in 1975 with the addition of analyses of edible portions of catfish for polychlorinated biphenyls (PCBs), pesticides and heavy metals conducted by the U.S. Food and Drug Administration (U.S. FDA) Cincinnati Laboratory.

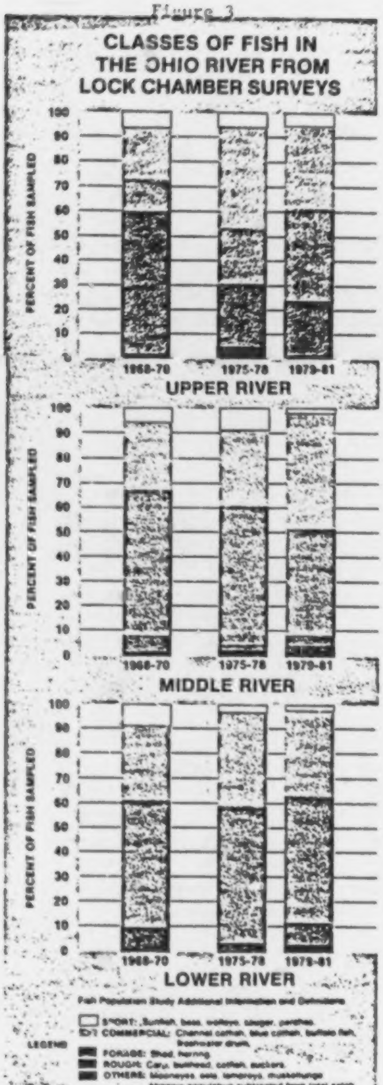
The lockchamber sampling for fish populations was continued annually through 1981, along with the tissue analysis. Findings regarding changes in fish populations are shown in Figure 3.

A total of 81 species of fish has been identified in the fish population surveys since 1968. Of these 81 species, 67 were found in the upper river; 58 in the middle river; and 56 in the lower river. The fact that 11 more species were found in the upper river than the lower is evidence of the physical, hydrologic and geographical differences along the Ohio. In all, 27 species are common to all parts of the river; the other 54 species can be found in only one or two of the segments.

The bar graphs classify the fish found according to the categories, "sport," "commercial," "forage," "rough" and "other." The bars represent the abundance of fish in each of these categories relative to the total catch. Minnows and Shiners were eliminated from the total before the calculation of these proportions. The available data have been grouped by years: 1968-70; 1975-78; and 1979-81.

As can be seen from the bar graphs, a significant increase in the number of commercially valuable fish, relative to the total catch, has been collected in the lockchamber surveys in the upper river in the studies conducted from 1968-70, the

Figure 3


CLASSES OF FISH IN
THE OHIO RIVER FROM
LOCK CHAMBER SURVEYS
PERCENT OF FISH SAMPLED
100
90
80
70
60
50
40
30
20
10
0
1968-70
1975-78
1979-81
UPPER RIVER
MIDDLE RIVER
LOWER RIVER
Fish Population Study Additional Information and Definitions
LEGEND
SPORT: Sunfish, bass, walleye, sauger, perches.
COMMERCIAL: Channel catfish, blue catfish, buffalo fish, freshwater drum.
FORAGE: Shad, herring
ROUGH: Carp, bullhead, catfish, suckers.
OTHERS: Mooneyes, eels, lampreys, muskellunge
Minnow population subtracted from total catch.

commercial species in the upper river represented 20.7 percent of the total; in 1975-78, this figure was 41.1 percent; and during 1979-81, it was 33.0 percent. The decreases in the commercial catch during the last three years may be due to a decrease in the data available during this time segment and natural changes in the populations.

Concurrently, the number of rough fish collected in proportion to the total catch has declined significantly. Almost 60 percent of the total catch collected in the upper river during 1968-70 was rough fish as compared to 22.1 percent collected in 1979-81. The number of forage species has also increased from 12.5 percent in 1968-70 to 37.5 percent during 1979-81. The number of sport class fish has remained relatively stable. The forage fish, mostly Gizzard Shad and Herring, are a food source for the larger species.

The amount of commercially valuable fish found in the middle Ohio River has also increased, although not as dramatically as in the upper river. In 1968-79, 27.1 percent of the total catch was represented by commercial species. This has steadily increased to 38.1 percent during studies conducted from 1979-81. Rough fish have been a relatively small proportion of the catch in this river segment; this proportion has decreased even further as have the numbers of forage fish.

The relative abundance of the five classes of fish has remained generally stable in the lower Ohio River. There has been a slight increase in the number of rough fish species, but this does not represent a significant proportion of the fish population in the lower river. There has also been a slight decrease in the number of sport fish relative to the total catch. This decrease may be more reflective of the lack of data available from the lower river.

Organics Detection

While this Commission's concern with organics can be traced back to limited programs on the taste-and-odor problems of the 1950's, it remained for a nationally publicized carbon tetrachloride spill into the Kanawha River, a major tributary of the Ohio, to focus public attention on the problem. The regulatory agencies were ill equipped to monitor the problem; industrial and municipal discharge permits furnished little light on the quantity and type of trace organics being discharged to the river system. Action was taken to provide additional protection for the approximately three million citizens dependent on the Ohio River as a source of drinking water. The genesis of an "Early Warning--Organics Detection System" began immediately after the carbon tetrachloride incident and was formalized in May, 1977, when the Commission acted to establish a system capable of determining daily levels of specific organic compounds in strategic reaches of the Ohio River and of three major tributaries to the upper Ohio. The principal purpose of the system was to identify unusually high levels of organic chemicals, such as chloroform and carbon tetrachloride, in the river system and provide timely warning of their presence to downstream water users. The timely identification of these unusual levels assisted greatly in regulatory agency efforts to pinpoint sources of the discharges. Again interagency cooperation and assistance was vital in the establishment and operation of the system.

Design of the system

Resource constraints resulted in setting an immediate goal of 11 stations in the system -- six in the upper river, four in the middle river, and one in the lower river. In 1983, a twelfth station, at East Liverpool, Ohio was added. The upper basin contains the greatest concentration of population and industry, and the six upstream sites include three in the lower reaches of major tributaries. Each station is located at a water treatment plant or industrial plant with laboratory facilities suitable for placement and operation of a gas chromotagraph. Laboratory space and operating personnel are provided by the cooperating utilities. The gas chromatograph, supplies, maintenance, and communication equipment (facsimile transmission via telephone) are provided by the Commission. The Commission is also responsible for scrutiny of chromatograms transmitted from each station to ORSANCO headquarters, to provide comparative analyses and appropriate notification of participants and state and federal regulatory agencies during unusual events. The ODS stations are limited in their capabilities. The equipment and method currently used detect organics which have boiling points of 150°C or less, are relatively insoluble in water, and contain halogens--a small percentage of the thousands of currently identified organic compounds. As resources permit, capability to detect other compounds will be added.

A quality control program is maintained in close cooperation with US EPA. A contract laboratory, capable of gas chromatographic-mass spectrographic analysis, is on standby, ready to perform confirmatory analyses as indicated by any unusual presumptive identification made at the field stations. When a presumptive identification significantly above background levels is reported, overnight shipping arrangements are made for additional samples, so that a confirmatory analysis may be available within 24 hours.

Funding

Grants from U.S. EPA permitted purchase of eight gas chromatographs for field sampling stations. Three utilities provided their own analytic equipment. U.S. EPA grant funds were also made available for assisting the Commission to meet operating costs in the start-up phase. Because of the phased nature of the grants, the system was established in two phases: seven stations in the first, and four in the second. The second phase was scheduled for completion in the first half of 1980. Equipment costs for the original 11-station system approximated $300,000. Annual operating costs, including the expenses of the Commission and the cooperating utilities (personnel and material), ranged from $40,000 - $50,000 per station in 1982. The annual cost of the system including supplementary and expanded monthly sample analysis for background characterization approximates $500,000.

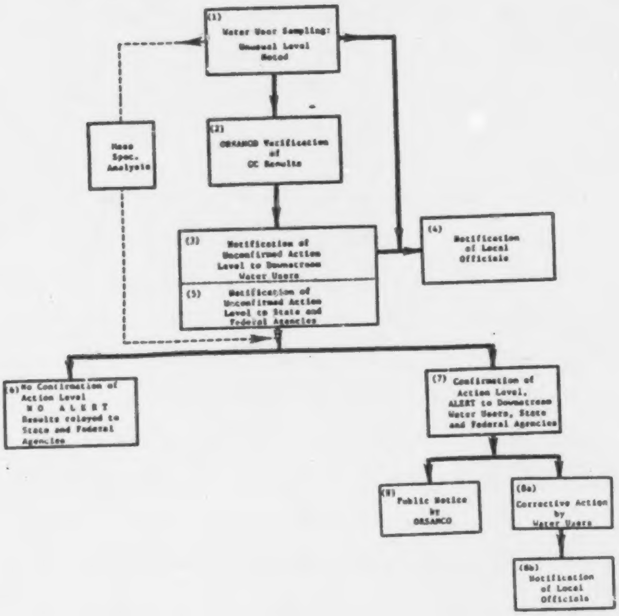
Effectiveness of the system

Shortly after the first phase of the system was placed in operation, the daily sample obtained at the station on the Kanawha River indicated unusual levels of purgeable organics presumptively identified as carbon tetrachloride and chloroform. This identification was confirmed by the contract laboratory the following day. The peaks indicated a pattern of increase on Wednesday, Thursday, and Friday, which was repeated the following week. The state regulatory authority was notified and conducted a field investigation which resulted in elimination of the unusual levels of the chemicals. Water users downstream from the confluence of the Kanawha and the Ohio were alerted. The chemicals were tracked. The Commission's time-of- travel and concentration estimates were proved accurate by actual sampling at the downstream sites. Experience has indicated that information about spills of any chemical or radiological materials to the river, whether of technical concern or not, should be quickly and accurately conveyed to the public. Procedures for response action to findings of unusual levels of organic chemicals by the Organics Detection System are indicated in Figure 4.

Basically, the ODS benefits the Ohio Valley in several ways:

1. The detection of increased levels of organic compounds and the immediate notification of downstream water treatment facilities can provide safer water to consumers.

Figure 4: Response Procedure


(1) Water User Sampling: Unusual Level Noted
Mass Spec. Analysis
(2) ORSANCO Verification of GC Results
(3) Notification of Unconfirmed Action Level to Downstream Water Users
(4) Notification of Local Officials
(5) Notification of Unconfirmed Action Level to State and Federal Agencies
(6) No Confirmation of Action Level NO ALERT Results relayed to State and Federal Agencies
(7) Confirmation of Action Level, ALERT to Downstream Water Users, State and Federal Agencies
(8) Public Notice by ORSANCO
(8a) Corrective Action by Water Users
(8b) Notification of Local Officials

2. The identification of the part of the river affected by an incident aids regulatory agencies in identifying the source or sources of pollution.
3. Daily analysis of river water for organic chemicals provide an extensive database on background levels of these compounds.
4. The presence of even a limited organic detection system serves as a deterrent to dischargers and emphasizes the need for improved control of discharges.

This last benefit is underscored by Figure 5.

Figure 5

RECORD OF UNUSUAL EVENTS DETECTED BY ODS, 1978-82

1978:	Wheeling, WV	May 23	Chlorinated ethanes and ethylenes
	St. Albans, WV	May	Chloroform, Carbon tetrachloride
	Pittsburgh, PA	June	Phthlate esters
	St. Albans, WV	Nov. 27-28,	Chloroform, Carbon tetrachloride, Other chlorinated ethanes and ethylenes
1979:	St. Albans, WV	Feb. 12-19	Dichloroethane Chloroform Carbon tetrachloride
	Pittsburgh, PA	February 20-24	Tetrachloroethylene 1,1,1-Trichloroethane Other chlorinated ethanes and ethylenes
1980:	Wheeling, WV	February 8	Tetrachloroethylene Chloroform
	St. Albans, WV	June 11-12	Chloroform
	St. Albans, WV	August 11	Chloroform
▷1981:	No Unusual Events Detected		
▷1982:	No Unusual Events Detected		

A clear need to increase the effectiveness of the system is intelligence on the significance of the chemicals being detected. At present there is a critical lack of guidelines on what levels are significant, both for acute and long-term effects for some chemicals. The latter is particularly of interest because of the low levels the system has been detecting. Another critical need is for a more effective and usable methodology for a wide range of organics.

Compliance Status

The last element of the monitoring program includes the compilation of essential information which does not deal directly with water quality and information and assessments from a variety of sources.

The inventory of the status of municipal and industrial wastewater control facilities--degree of treatment, compliance with applicable requirements, operations, etc.--throughout the Ohio River Basin was initiated in 1952 and is updated by the states each year. This inventory provides a current, basin wide record of waste load limitations and compliance schedules for all discharges to the Ohio River. It is continuously updated from the National Pollutant Discharge Elimination System permits as issued, amended and reissued. This information is essential for the assessment of current water quality and estimations of future water quality.

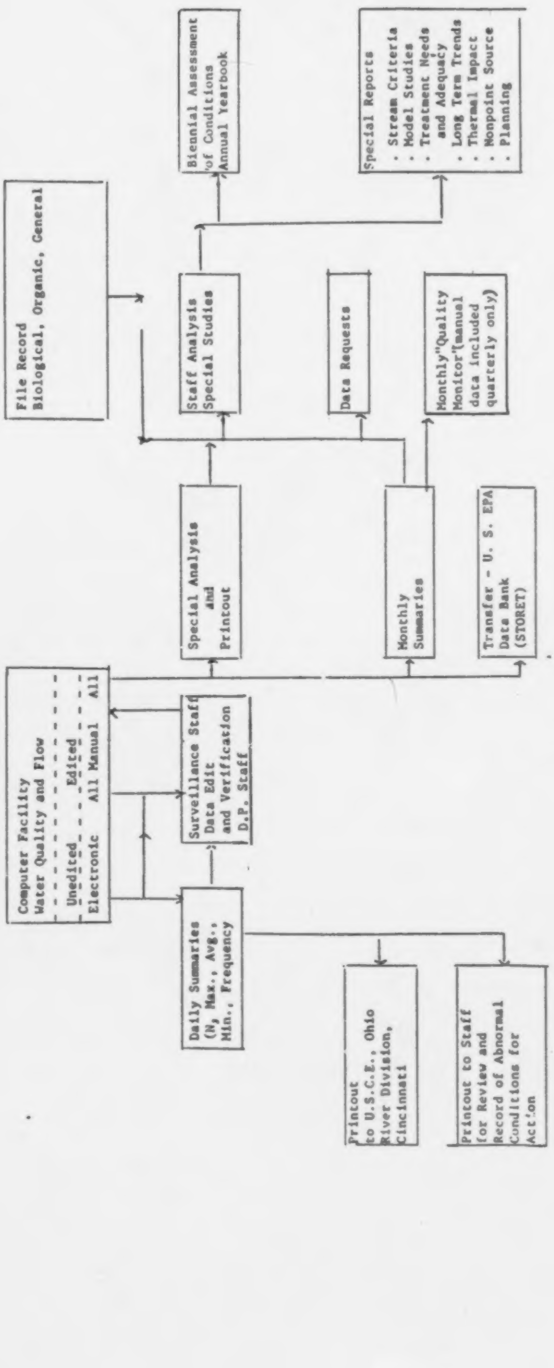
Environmental impact statements, facilities plans and design reports, local, regional and state planning reports, research reports and a variety of other documents relating to the Ohio River provide a continuous flow of background information on conditions which may impact localized or general water quality in the Ohio River. This growing library of information--dating back to Harold Streeter's 1914-15 Ohio River Studies--is a significant input to the continuing assessment of water quality conditions and revision of the various elements of the Commission's monitoring program.

Data utilization

Data acquisition is a service function justified only if the information is utilized in a timely manner. Figure 6 shows the data flow from storage and processing through the staff to produce a defined set of outputs.

Unedited hourly electronic monitor data (dissolved oxygen, dissolved solids, temperature, pH) serves several important functions. Daily summaries as well as instantaneous readouts are available to the U.S. Corps of Engineers. The Corps uses this information in the control of tributary reservoir releases and to

Figure 6
ORSANCO MONITORING PROGRAM
Data Processing and Utilization


Computer Facility
Water Quality and Flow
Unedited
Edited
Electronic
All Manual
All
Daily Summaries (N, Max., Avg., Min., Frequency)
Printout to U.S.C.E., Ohio River Division, Cincinnati
Printout to Staff for Review and Record of Abnormal Conditions for Action
Surveillance Staff Data Edit and Verification D.P. Staff
Special Analysis and Printout
Monthly Summaries
Transfer - U. S. EPA Data Bank (STORET)
File Record Biological, Organic, General
Staff Analysis Special Studies
Data Requests
Monthly "Quality Monitor" (manual data included quarterly only)
Biennial Assessment of Conditions Annual Yearbook
Special Reports
. Stream Criteria
. Model Studies
. Treatment Needs and Adequacy
. Long Term Trends
. Thermal Impact
. Nonpoint Source
. Planning

adjust operation of the gates and navigation dams for timely control of stream quality conditions - particularly during low flow periods.

The daily summary is reviewed by staff to gain an immediate overview of water quality and to note violations of the state stream standards or unusual conditions. Continued standards violations or unusual conditions are documented and the state regulatory agencies are informed. As noted in the discussion of the monitoring program, laboratory reports on the samples collected on a schedule by Commission Surveillance Specialists are also reviewed on receipt, and exception reports are prepared.

Routine and special computer outputs along with the information from the biological, organic and general information monitoring program are used by the staff in the preparation of a wide range of routine and special reports and studies, and to fill data requests.

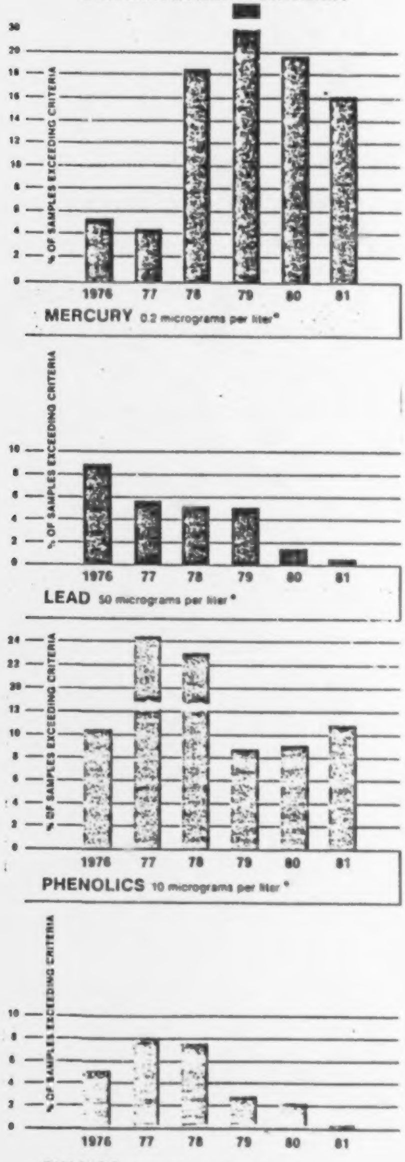
A look to the future

The Commission's monitoring program undergoes continuing review by interagency work groups and staff to determine the appropriateness of and need for specific data, to improve program cost effectiveness and to adjust to the need for obtaining information on additional quality characteristics. This review points out local,state and federal needs, that can be met more economically and effectively through Commission monitoring programs. The monitoring programs are thus built from the ground up and are based upon existing and anticipated problems. The common denominator of water pollution problems is the river basin and that is why monitoring, as a function of a regional entity like the Commission, has been applied so successfully.

The concept of regional management of water quality is not new, but in the US, its acceptance has lagged behind that relating to regional water resource development.

In the Ohio Valley, the concept of regional management of water quality has been widely recognized. As an instrument of the states, working closely with the federal agencies concerned, the Commission is receiving increasing responsibility in its role of coordinating and carrying out the basin-wide monitoring program which is recognized as an essential element in achieving cleaner streams. In today's chemical age, it is truly a challenging task to assure that river monitoring and surveillance programs are dynamic ventures subject to continuous scrutiny as additional knowledge and techniques raise issues concerning river water use.

Monitoring of the Ohio River provided the information for the development of these graphs. Such information is essential for control programs.

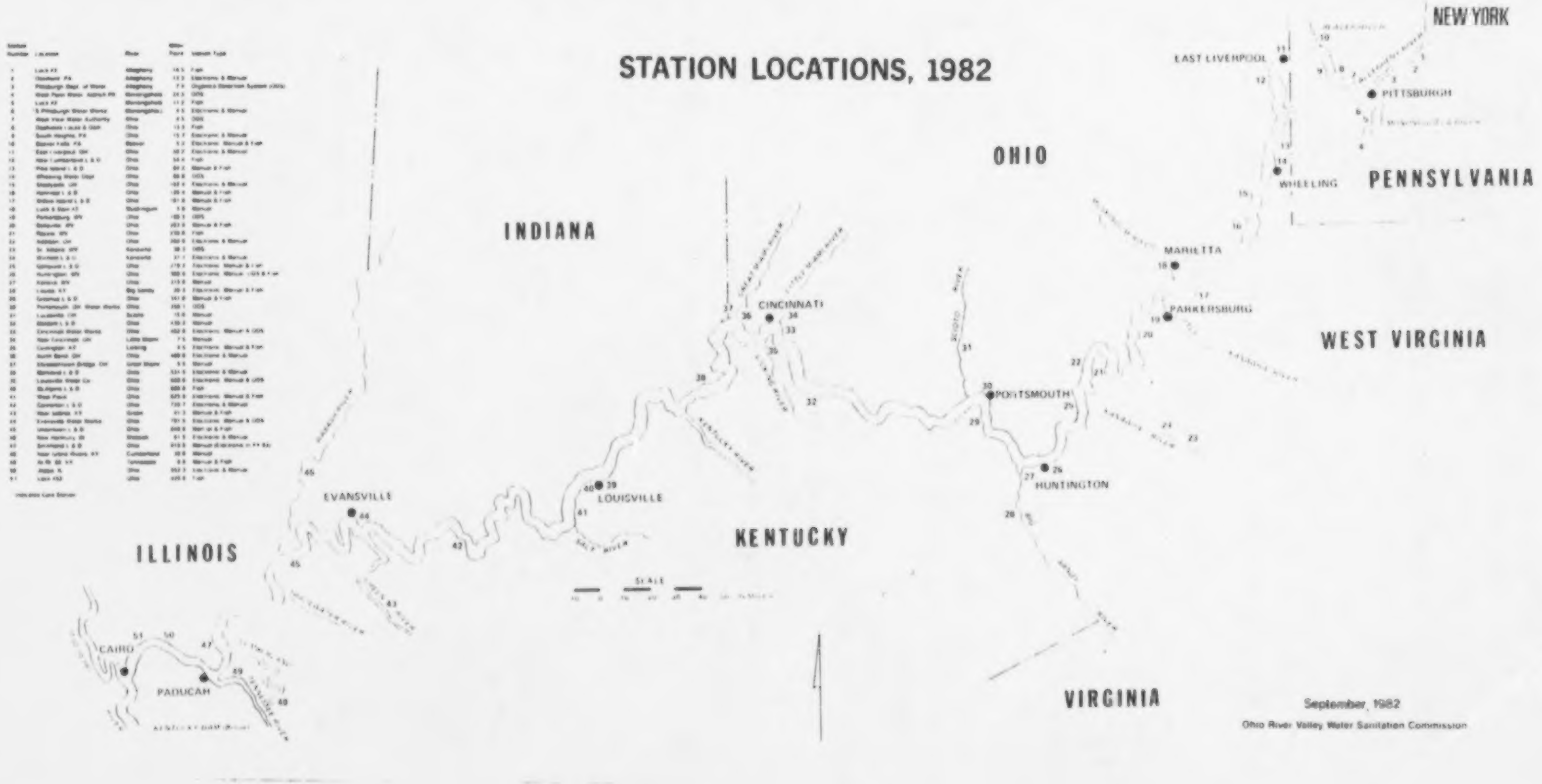


PERCENT OF OHIO RIVER SAMPLES
EXCEEDING
CERTAIN STREAM CRITERIA

*CRITERION

Based upon 12 monthly samples taken at 22 locations on the Ohio River.

STATION LOCATIONS, 1982


NEW YORK
PENNSYLVANIA
OHIO
WEST VIRGINIA
INDIANA
ILLINOIS
KENTUCKY
VIRGINIA
EAST LIVERPOOL
PITTSBURGH
WHEELING
MARIETTA
PARKERSBURG
PORTSMOUTH
HUNTINGTON
CINCINNATI
LOUISVILLE
EVANSVILLE
CAIRO
PADUCAH
SCALE

September, 1982

Ohio River Valley Water Sanitation Commission

Mr. SCHEUER. Thank you very, very much.

Mr. Sylte, you may take 7 or 8 minutes to summarize your testimony, and then we will have some questions, I am sure, for both of you.

STATEMENT OF WILLIAM SYLTE, CHIEF DEPUTY EXECUTIVE OFFICER, CALIFORNIA AIR RESOURCES BOARD

Mr. SYLTE. Thank you, Mr. Chairman.

I am Bill Sylte; I am the chief deputy executive officer, representing the California Air Resources Board and also, to a limited extent, some of the other directors of State air programs across the country.

My topic is ambient air monitoring, and I will discuss two categories: monitoring for conventional or, as EPA terms them, criteria pollutants and also toxic or noncriteria pollutants. I am afraid it is a classic "good news-bad news" story that I have to give you.

There have been a number of improvements in the data base recently for conventional pollutants, which means that we do have the basic data base we need now to make most of the program policy decisions in that area. However, we do not have anything resembling a comparable data base for toxic pollutants. That, in turn, has a rather negative effect on our efforts to implement control programs.

My perspective on ambient air monitoring is that of an air program administrator; that is, a user of data in the day-to-day operation of an air pollution program.

I think it is worthwhile to review some of the general purposes to which air program administrators put a good, accurate, and complete data base.

I suppose the most fundamental use of data is that it tells us whether or not air quality problems actually exist. If pollutants are found at safe levels, of course, we are in a preventive regulatory posture rather than a remedial one.

Second, when problems do exist, this data allows us to estimate the magnitude of the health danger—how many people are affected and to what extent are they affected. Ambient data, in combination with other information, also allows us to design strategies to reduce emissions and attain better air quality. Finally, ambient air data trends, when they are carefully interpreted, tell us how well we are doing with our programs.

As I said, for conventional pollutants—and, again, I am talking here mainly about those for which EPA has set ambient standards—the data base has improved rapidly in the last several years. Much of this improvement is due to the efforts of the Environmental Protection Agency, which has been working quietly with States and local agencies for a number of years.

While there is still room for improvement, I believe that overall we do have the machinery in place to operate an ambient monitoring system for conventional pollutants which is adequate for basic policy decisions.

However, the good news for conventional pollutants is in sharp contrast to the situation for the toxic or noncriteria pollutants. On a national scale, certainly, we do not have the quantity or quality of data that we need for the four purposes I listed earlier.

Before elaborating on that point, I would like to briefly summarize some of the special problems that we encounter as we try to monitor for toxic air pollutants.

First, it is extremely difficult to select the toxic pollutants for which to monitor. There are no national standards. Very few of these substances have been identified as hazardous under the Clean Air Act. We have literally hundreds of different substances which may be present in the ambient air and which may pose some degree of risk to humans. Many, of course, are known or suspected human carcinogens. While some of these are ubiquitous in urban areas—that is, widespread—others are found only in the vicinity of discrete sources. This means that the mix of pollutants you will find will vary considerably between urban areas and within an urban area. Thus, the monitoring priorities would be different from place to place as well.

Second, standard methods of sampling have not been developed yet or published by any authoritative body.

Third, of course, is cost. Cost is a very major constraint. The expense involved, particularly in analyzing samples, flatly prohibits toxics monitoring for most air agencies.

The cost of acquiring toxics data has in California been at least 25 times more expensive per unit of data as for conventional pollutants.

As an aside, as I was reading through this testimony on the plane, I realized that I had included a number of cost figures in here to impress you with how expensive it really is to do this job, and I forgot that I was talking to people who are used to looking at the national budget. From that perspective, these numbers may not look very large, but I assure you that to State and local agencies they represent a very expensive proposition.

There are a number of other issues and problems which face toxics programs, and I am not telling you that acquiring a good data base is a panacea; that it is going to solve all of those problems. However, consider for a moment what it means to the public and industry not to know exactly what the public is exposed to.

At low concentrations, such as those found in the ambient air, the health effects that we are concerned about are chronic health effects; that is, those that are due to very long-term, low-level exposure. Now if health authorities do not know what that level of exposure is, they cannot be very reassuring to the public. The public, in turn, quite logically, wants very stringent control. From industry's perspective, that is a rather alarming proposition. Since the premise on which control is predicated is the notion that almost any amount of a potentially toxic material released into the air may endanger the public health, there is really no logical limit in that situation to the degree of control which may be required. Therefore, industry is very concerned that some of the substances which they market and use could be banned entirely or eliminated from the marketplace due to the cost of control.

This regulatory climate has all the ingredients of confrontation and stalemate that we often see, at least in States and in local areas, when we approach the subject of controlling toxic air contaminants.

I think that a good, reliable ambient data base would provide a very powerful means of easing those tensions.

I would conclude with the following recommendations on toxic pollutants monitoring:

We need rapid development of standardized methods of sampling and analysis of the various pollutants. EPA is being helpful in this regard at the staff level, but I think the effort needs a very high policy priority within that agency.

State and local agencies need more resources to acquire the equipment and personnel and training that they need. I know that is an old saw, but I think it is certainly true in this case.

In the long run we are going to have to come up with some major economies. This whole toxic monitoring business is too expensive. We are going to have to develop new methods, new instruments and techniques, so that we can do a better job of monitoring for these various substances. I think applied research, presumably conducted at EPA, would be very helpful in that regard.

However, for the foreseeable future, we are going to need sophisticated laboratory support. That is not available to many State and local agencies today. We are going to need a system of centralized laboratories or regional laboratories to which State and local government has access. That would be very, very helpful.

Thank you for your attention.

[The prepared statement of William W. Sylte follows:]

Statement of William W. Sylte,
Chief Deputy Executive Officer,
California Air Resources Board

Before the

Sub-Committee on Natural Resources,
Agriculture Research and Environment,
James H. Scheuer, Chairman

May 26, 1983

It is my honor and pleasure to be here today to discuss some general policy perspectives on the status of ambient air monitoring in my state, California, and elsewhere in the country. The term "ambient air," as I will use it today, refers to outdoor air to which the public has general access. Of course, people are also exposed to airborne pollutants on the job, at home and elsewhere, but those avenues of exposure are beyond the scope of my discussion today.

My perspective on ambient air monitoring is that of an air pollution program administrator -- a user of the data collected. I am involved in the day-to-day operation of the Nation's largest state air program and in providing advice to elected and appointed officials on air pollution control policies. There is no doubt that accurate and complete ambient data is the cornerstone of a mature and successful air pollution control program. It is for this reason California agencies spend over $10 million per year on air monitoring and operate over 650 samplers located throughout the state.

I will address the status of two major categories of ambient monitoring; conventional or "criteria" pollutants and toxic or "non-criteria" pollutants. I am afraid that there is good news and bad news to report. Before addressing these categories however, I would like to review the general policy uses to which we can put accurate and complete data:

- Ambient data tells us whether air quality problems exist. If pollutants are found at "safe" levels, or not found at all, we are in a preventive rather than a remedial situation.
- Ambient data defines the magnitude of the problem by permitting us to estimate the severity of health effects and the approximate number of people affected.
- Ambient data in combination with other technical information aids in developing strategies to solve air quality problems.
- Ambient data trends, when carefully interpreted, can measure our progress in solving the problem and lead to adjustments of control strategies.

For conventional pollutants, namely those for which EPA has established national ambient standards plus a few others, the monitoring data reliability has improved rapidly in recent years. As a result, it is now possible to use recently collected data with a relatively high level of confidence for each of the purposes listed above. On a national scale, much of the improvement is due to the efforts of the embattled Environmental

Protection Agency. For the past dozen years, EPA has worked quietly with state and local agencies to achieve a high degree of national consistency in the siting of stations, the type of equipment in use, the maintenance and calibration of equipment, and the handling of data. Detailed written requirements have been published and reinforced by EPA audit teams.

State and local agencies, which currently operate about 5000 ambient samplers nationwide, have made many changes in past practices to comply with EPA's program. These changes have been expensive. The annualized cost of establishing and operating a single fully equipped air monitoring station in California is roughly $85,000. When processing and reporting are added to the cost of collection, the tab grows appreciably. Overall, each of the 5,000,000 bits of air monitoring data collected annually in California costs approximately $2.

There is, of course, still room for improvement in the national system for conventional pollutants. The representativeness of some data is subject to question as are procedures for identifying and culling out misleading numbers. A major effort is necessary to install a network to support EPA's new proposed fine particle standard. We do not have enough reliable data on precursors of ozone and secondary particulate matter. Increased automation could reduce costs and create other efficiencies. Overall, however, the programmatic machinery is in place to operate an ambient monitoring system for conventional pollutants which is adequate for basic policy decisions.

The relatively good news about conventional pollutant monitoring stands in sharp contrast to the situation for toxic or "non-criteria" pollutants. On a national scale we do not have the quantity and quality of ambient data needed for the four purposes I listed earlier. As you might expect, this situation has a profound effect on our ability to establish and carry out control strategies to reduce exposure to toxic air pollutants.

Before discussing the implications for control programs, however, I would like to summarize some of the special problems we face in monitoring toxic pollutants:

- It is extremely difficult to select the pollutants which should be monitored. There are no national ambient standards to establish priorities. Few pollutants have been identified as hazardous under the Clean Air Act. Instead there are literally hundreds of substances which may be present in the ambient air and which are known to, or may, pose a risk to humans at some level of exposure. Many, of course, are known or suspected human carcinogens. While a few are ubiquitous in urban areas, many can be expected to be found only in the vicinity of discrete sources. This means that the mix of pollutants in the ambient air will vary widely between and within populated areas.
- Standard methods of sampling and analysis have not yet been established by any authoritative body. Most sampling is done by manual methods which have

traditionally been used for other purposes. Although these methods are based on sound scientific principles, the variety of methods in use cause data consistency and comparability to suffer. If history is any guide, some of the data which has been collected to date will prove to be inaccurate to at least some degree when methods are refined.

- Cost is a major constraint on the quantity and type of data which can be collected. The expense involved flatly prohibits toxics monitoring for most air agencies. Depending on the methods in use and the pollutant being sampled, the ARB has experienced sample collection costs for toxic pollutants which are 5-10 times as high as for traditional pollutants. The major constraint, however, is analytical cost. Samples must generally be processed in the laboratory by highly skilled chemists and technicians using complex and sensitive equipment capable of detecting various compounds in concentrations in the part per billion range. The equipment used in the ARB laboratory, for example, costs roughly $2 million to purchase. Overall, each bit of ambient toxics data has been more than 25 times as expensive to acquire as conventional data.

There are, of course, numerous other issues related to toxic control programs. Many of these would continue to exist even if the major monitoring problems listed above were solved. But our inability to quantify ambient exposure to toxic substances feeds the anxiety of both the public and those who manufacture and emit these substances.

Consider for a moment what it means to the public and industry to be ignorant of the level of toxic pollutants to which people are exposed. At low concentrations such as those found in the ambient air, the health effects of concern normally occur from long-term exposure. If health authorities do not know the level of routine exposure, the public cannot be informed of the estimated degree of health risk. Not knowing the magnitude of danger, the public understandably insists on stringent control. They reason that if pollutants are not emitted to the air in the first place, any problem which may exist will be solved. In the face of this attitude, industry sees the potential for unneeded and excessive control. Since control is predicated on the concern that any amount of a potentially toxic material released to the air may endanger the public health, there is no logical limit to the degree of control which may be required. Some substances may be banned outright and others driven from their market by the cost of control.

Clearly these are the ingredients of confrontation and stalemate -- a condition which poorly serves the public interest. People should not have to breathe dangerous chemicals, industry should not face unnecessarily stringent control requirements, and public health policy debates should not be crippled by polarization and hysteria.

While not a panacea, a reliable ambient data base for toxic pollutants would provide a powerful means of easing tensions. It would allow public health authorities to more accurately describe the magnitude of risk. Substances which are absent or found in safe concentrations would face moderate control policies designed to prevent them from becoming a problem. Control agencies could set reasonable priorities and calibrate control requirements to the severity of the health danger posed by each substance.

Given the problems outlined earlier, an adequate ambient data base for toxic pollutants cannot be developed overnight. Without additional resources and a concentrated, well directed effort to solve these problems however, we can look forward to a badly handicapped regulatory effort for at least the next decade. The following actions are needed to improve the situation.

- The rapid development of standardized methods of sampling and analysis of various pollutants is extremely important. The EPA and others have already performed considerable technical analysis of the various methods in use, but the program needs a high policy priority at EPA and strong support from state and local agencies.

- State and local agencies need more resources to acquire the equipment, personnel and training they need to improve and expand ambient monitoring for toxic pollutants. Overall, federal financial support for state and local air pollution programs has declined significantly in real dollars during the last decade. Although state and local funding has picked up the slack thus far, I do not believe it is realistic to expect a major improvement in the monitoring situation without increased federal financial aid.
- In the long run, major economies are necessary to sustain a viable monitoring program nationwide. New methods, new instruments and new procedures need to be developed which are less expensive and more efficient than current practices. Applied research needs to be accelerated to develop these tools. The private sector can be extremely helpful if they are provided with appropriate public sector support.
- For the foreseeable future, sophisticated laboratory support will be necessary to analyze manually collected samples. Since most air agencies cannot afford these facilities, an attractive concept is a system of central laboratories capable of providing support to a number of state and local air agencies.

I understand that EPA is considering such a system at this time.

- Until monitoring can be accelerated and adequate data acquired, public agencies must depend heavily on estimates of ambient concentrations. These estimates, in turn, are based largely on knowledge of the quantity and location of toxic pollutants emitted to the air. Technical assistance from EPA is very important in helping states improve emission inventories.

In summary, there have been major improvements in ambient air monitoring for conventional pollutants in the last several years. With continued support by the Congress and EPA, state and local agencies should be able to sustain this effort. We do not, however, have an adequate data base to deal with toxic air pollutants. To the extent public concern for toxic pollutants continues to grow, monitoring deficiencies will increasingly hamper our efforts to design and administer a balanced and effective control program.

Mr. Scheuer. Thank you very much.

I am going to ask unanimous consent that, since time is pressing in on us, that members be enabled to ask questions in writing. We will submit questions in writing to both this panel and to the second panel. We will hold the record for 10 days or 2 weeks, whatever is needed to get the answers. Therefore, we hope that the witnesses could answer the questions that they will get as expeditiously as possible.

There being no objection, so ordered.

Mr. Scheuer. Mrs. Schneider, do you have any questions for either or both of the two very excellent witnesses?

Mrs. Schneider. Yes.

Mr. Clausing, I was wondering if you could tell me—you said in your testimony that EPA carries out a very limited program of monitoring in the Ohio Valley. We had some witnesses from the USGS come before us a couple weeks or so ago, and they had shown us their various stream points, their sampling points. Evidently, your commission does sampling much more frequently and also has many more sampling points.

I was wondering to what degree you share that data with USGS.

Mr. Clausing. That data is stored in STORET. It is available to them. I will defer, if I may, with your permission, to Mr. Weaver. He is the chief engineer and personally handles this. He can go into detail.

Mr. Weaver. Thank you.

We work very closely with the U.S. Geological Survey, U.S. EPA, U.S. Corps of Engineers. Part of the commentary that Mr. Clausing skipped to shorten his presentation concerned our technical committee which is made up of the heads of the water pollution control programs of the States and the agencies.

When we develop a monitoring strategy, that monitoring strategy reflects the input of those authorities, and as it goes to the commission, it then reflects input from varying groups, including industry, public interest, and so on. Finally, you have an approach which meets the needs of the various agencies and groups. This approach is focused on the data that goes into the national collection system, STORET, to which all of these agencies contribute. This central storage makes data available to everyone. That is how it works.

Mrs. Schneider. From what you are saying, then, the monitoring in the Ohio River Valley is really quite comprehensive, and may I also go so far as to say "perfect"?

Mr. Weaver. Perfect?

Mrs. Schneider. Yes. That sounds like the ideal world where you have the participation of all the different monitoring agencies. You are doing more sampling. It is all interrelated, and you can have a real comprehensive view, then, of what the situation is.

Mr. Weaver. We are ever striving for perfection. I would not say that we have arrived, but we are trying.

Mrs. Schneider. OK.

I have a question for Mr. Sylte. Insofar as your discussion about the need for ambient data base collection for toxic pollutants and the fact that we had a hearing, as I mentioned before—EPA testified and they said that they had no plans right now for establishing any kind of routine national noncriteria pollutant monitoring program.

I am wondering what your response might be to that.

Mr. SYLTE. Well, I am not aware of exactly what they had in mind.

Mrs. SCHNEIDER. It sounds like they do not have anything in mind.

Mr. SYLTE. They are doing a number of things. They are certainly using their laboratory and research arms in North Carolina to provide guidance on the techniques for sampling, what the benefits and detriments are of the various techniques. They are providing information on the proper analytical methods, once you have collected the samples. That is the kind of information that we need.

I think the State and local agencies do most of the ambient sampling now that is done in the country, the vast majority of it. There are over 5,000 monitoring instruments that are run by State and local agencies. We can continue to do the sampling for toxic air pollutants. I do not think we need a nationally administered monitoring system.

Mrs. SCHNEIDER. Sampling process.

Mr. SYLTE. However, we do need technical help, and we certainly need that laboratory support around the country.

Mr. SCHEUER. We are having the second vote on the MX in about 5 minutes.

Again, to Mr. Clausing, your commission's monitoring system, as Congresswoman Schneider said, has been widely praised, lavishly praised at our first hearing last week. Do you know of any other monitoring systems which are as effective as your ORSANCO's, any other monitoring systems for other river basins around the country?

Mr. CLAUSING. No, I do not know of any. I know our monitoring system is very effective and very useful to the water utilities, as we explained in the testimony—but I do not know of any others.

Mr. WEAVER. May I respond to that, sir?

Mr. SCHEUER. Briefly.

Mr. WEAVER. That statement is essentially correct, with one thing that I think would be particularly of interest to you. There is an interstate commission, the ISC, in the New York City area which is——

Mr. SCHEUER. As a matter of fact, New York State is part of ORSANCO.

Mr. WEAVER. Right. The Interstate Sanitation Commission operates an effective monitoring system in a limited area namely, the New York City-Connecticut area.

Mr. SCHEUER. You are suggesting, that also is effective?

Mr. WEAVER. Yes, sir.

Mr. SCHEUER. Would the technical, management and organizational elements that were developed in establishing your commission's monitoring system be readily transferable to other areas of the country for monitoring other river systems?

Mr. CLAUSING. I do not know why it would not be. It should be.

Mr. SCHEUER. Would the Federal Government have a potential role in effecting this transfer of talent and ability and systems?

Mr. CLAUSING. I would refer that to Mr. Weaver, but I would say definitely they would have.

Mr. WEAVER. I would certainly concur in that, Mr. Chairman. I was extremely interested in your lead-in commentaries, when you talked about a commission. There are so many interests in this area that some mechanism such as a commission that would seem to have a considerable amount of promise. I would certainly hope that this could be explored further and something could come of it.

Mr. SCHEUER. All right. Thank you very much.

Mr. Sylte, you mention in your testimony that increased Federal financial aid is needed and that public sector support is needed to develop less expensive and more efficient instruments and procedures, and that technical assistance from EPA is very helpful and important in helping States improve their emission inventories.

Do you consider these to be appropriate contributions from the Federal Government in what could be a national environment monitoring program? Is this one contribution the Federal Government can make, and are there others that would also be helpful?

Mr. SYLTE. I think we can share some of the costs with the private sector. For example, in and around facilities that we know emit hazardous substances, we can, through regulatory policy, require the private sector to share some of the monitoring cost. I think that is a useful contribution.

Because a lot of the technical work is done more efficiently in a centralized system, I think a Federal share is very important.

Mr. SCHEUER. All right. Thank you.

Assuming, then, that the Federal Government will play this centralized role, what role then would be left for the States and the regional commissions and localities?

Mr. SYLTE. We can certainly collect the data.

Mr. SCHEUER. Collect the data?

Mr. SYLTE. Some of us can analyze it. I think if we develop more effective economical monitoring equipment, perhaps we could do more of both. Also, I think we can run our own control programs. Because of the different nature of toxic air pollution from conventional pollution, I think probably we are going to have to have customized control strategies for various urban areas, and I do not think the same type of Federal approach that has been used for conventional pollutants is quite applicable.

Mr. SCHEUER. All right. Thank you very much.

We are going to suspend now for about 10 minutes while the full membership of this subcommittee gets the second vote on the MX missile.

We will be back in 10 minutes.

[Recess.]

Mr. SCHEUER. The hearing will resume.

We will call our second panel: Dr. John W. Farrington, Woods Hole Oceanographic Institution; Dr. Charles N. Ehler, accompanied by Dr. Eric D. Schneider, Assistant to the Administrator for Oceanic Programs, both of them from the National Oceanic and Atmospheric Administration; and Mr. A. Alan Hill, Chairman of the Council on Environmental Quality.

Would the four of you please come to the table?

Well, we are delighted to have you here today. We will ask each of you to speak for 7 or 8 minutes, speak informally, hopefully not read your prepared text because you will not have time to read your prepared text. Your prepared text will be printed in full in the record. Then after you have all addressed us, we will, I am sure, have some questions for you.

Thank you for your patience in waiting while we attended to our voting duties. We appreciate your patience.

We will now call upon the witnesses to give us their informal 7- or 8-minute summation. First, we will call on Dr. John W. Farrington of the Woods Hole Oceanographic Institution on Cape Cod, Mass.

STATEMENT OF DR. JOHN W. FARRINGTON, DIRECTOR, COASTAL RESEARCH CENTER, AND SENIOR SCIENTIST, CHEMISTRY DEPARTMENT, WOODS HOLE OCEANOGRAPHIC INSTITUTION, WOODS HOLE, MASS.

Dr. Farrington. Thank you, Mr. Chairman. I would like to thank you and the committee for the opportunity to testify here.

I will summarize briefly my testimony for you and make myself available to answer your questions.

I would like to emphasize for the record that my statement is, of course, that of an individual scientist and is not an official policy statement of my Institution.

I think the best way of proceeding is to address first a particular example from the U.S. mussel watch program which indicates one aspect of my recommendations, and that is the need for close collaboration and interaction between research activities and environmental quality and monitoring activities. This concerns the dataset for 1976, 1977, and 1978 for the distribution of plutonium in the tissues of mussels and oysters collected around the coast of the United States.

In that dataset we saw a consistent factor of 10 elevation of plutonium concentrations in mussels from the central California coastline. Some of this data evidently got loose, if I may use that term, in Washington without any interpretation, and led to some concern because that particular geographic location is also the location of the Fanalon Islands offshore. In the deeper waters off the Fanalon Islands there is an area where nuclear waste, low-level nuclear waste, material had been disposed. Some people took this data and interpreted the higher concentrations for that coastline as an indication that the material was leaking and making its way to the surface waters from that dumpsite.

Fortunately, Professor Goldberg of Scrips Institution of Oceanography and Dr. Vaughan Bowen of our Institution had been involved in research for many years looking at plutonium distributions in the oceans. They were able to point out from their data that the elevated concentrations in plutonium in the mussels from the coast of California were not the result of leakage from the canisters but represented what we would term the natural biogeochemical cycle of plutonium in the environment. This is plutonium that entered the North Pacific as a result of nuclear weapons testing in the 1960's and had made its way to that coastline due to natural oceanic processes.

I think that this illustrates one facet of what we have learned from the U.S. mussel watch program. We need to constantly have this interaction between state-of-the-art research and monitoring programs if we are really going to have effective interpretation of the data.

The second, relatively brief example is the use of the data from the mussel watch program in the identification of hot spots, and I will use the example of PCB's.

By having the national dataset on polychlorinated biphenyls in the tissues of the mussels and oysters, we were able to show to the local and State officials in Massachusetts that the Acushnet River Estuary, where the city of New Bedford is located, was indeed a hot spot of PCB contamination. The mussels in that area recorded a factor of 10 higher PCB concentrations than anywhere on the U.S. coastline. This data and other data collected in that area since that day have resulted in 1982 in the site being designated as a Superfund hazardous waste site.

The collection of mussels on the coastline of Buzzards Bay and the transplant mussel cages have led to an effective prototype local monitoring program in that area as to what is happening to the PCB's and whether they are spreading from the estuary into the Buzzards Bay area.

There are many other examples I could site, but I put those in my written testimony. One of the things that we have faced as participants in the mussel watch program is the expectation that this program will, indeed, solve all marine environmental monitoring problems for the coastal areas of the United States.

The dataset was going to provide all of the information that was needed. This is one of the problems we ran into. Regulators in many agencies are often looking for the magic, one-shot measurement that is going to provide all the information. I think you know from your testimony, the testimony your committee has received, that this is not the case.

I want to emphasize that some of the critique of this program is based on the fact that it does not provide an assessment of the effects of chemicals in the marine environment. That is quite true, and the participants knew that from the outset. This is an area where we have to conduct much more research in order to have effective monitoring programs. We need to understand how to measure the effects, in addition to the presence, of chemical contaminants in the coastal waters of the United States.

Now I have made several recommendations for which I will not go into any detail, Mr. Chairman, because they are in my written statement. I hold myself available for questions from your committee.

[The prepared statement of Dr. John W. Farrington follows:]

TESTIMONY OF:

DR. JOHN W. FARRINGTON

Director, Coastal Research Center
and
Senior Scientist, Chemistry Department
Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

__Mr. Chairman__: Thank you and your committee for the opportunity to present testimony on the subject of environmental monitoring. Before proceeding, I wish to emphasize that my statement is that of an individual scientist and does not constitute an official policy of the Woods Hole Oceanographic Institution.

My research experience of the past fifteen years has primarily been in biogeochemistry of natural, man-mobilized, and man-made chemicals in the marine environment. This has included studies of the inputs, reaction rates, and reaction pathways of chemicals in the marine environment and interactions with living organisms. My testimony is based on this experience and knowledge gained from the research of colleagues.

In response to your letter of invitation, I will focus my testimony on two topics:

(1) A brief description of the "Mussel Watch" program, and results and interpretations of data from that program, and

(2) Recommendations for improvement in environmental monitoring in the marine environment.

THE U. S. MUSSEL WATCH PROGRAM: 1976 TO PRESENT

This section of my testimony is based in large part on an article, "Bivalves as Sentinels of Coastal Chemical Pollution: The U. S. Mussel (and Oyster) Watch", now in press in __Oceanus__ magazine. The editor, Mr. Paul Ryan, has graciously allowed free quotation for purposes of this testimony. With your permission, I quote and paraphrase from this article because it contains much of the information I can provide on behalf of my colleagues in the Mussel Watch program in answer to your request.

Oceanus quotation begins:

"The U. S. Scientific Committee on Problems of the Environment (SCOPE) of the International Council of Scientific Unions (ICSU) convened an ad hoc meeting sponsored by the Environmental Studies Board of the U. S. National Academy of Sciences, acting as the U. S. SCOPE Committee, on March 31, 1975 to discuss U.S. national strategies for marine pollution monitoring. Prior to that time there had been various local and regional measurement strategies carried out in a few areas of the U. S. coast. The experience gained in these programs and elsewhere in the world, particularly Europe, Japan, and Australia, were evaluated at the meeting chaired by Professor Edward Goldberg of Scripps Institution of Oceanography. The consensus was to formulate and pursue a trial or prototype program of coastal chemical pollution monitoring on a national scale using the sentinel organism concept. The common blue mussels, Mytilus edulis and Mytilus californianus, and oysters (Crassostrea virginica) were chosen as the sentinel organisms. The reasons for choosing this strategy and these organisms were derived from hundreds of references in the literature of research and monitoring and can be summarized as follows:

(1) Bivalves are cosmopolitan (widely distributed geographically). This characteristic minimizes the problems inherent in comparing data for markedly different species with different life histories and relationships with their habitat.

(2) They are sedentary and are thus better than mobile species as integrators of chemical pollution status for a given area.

(3) They have reasonably high tolerances to many types of pollution in comparison to fish and crustacea.

(4) They concentrate many chemicals by factors of 10^2 to 10^5 compared to seawater in their habitat. This makes trace constituent measurements often easier to accomplish in their tissues than in seawater.

(5) Inasmuch as the chemicals are measured in the bivalves, an assessment of biological availability of chemicals is obtained.

(6) In comparison to fish and crustacea, bivalves exhibit low or undetectable activity of those enzyme systems which metabolize many xenobiotics such as aromatic hydrocarbons and polychlorinated biphenyls (PCBs). Thus, a more accurate assessment of the magnitude of xenobiotic contamination in the habitat of the bivalves can be made.

(7) They have many relatively stable local populations extensive enough to be sampled repeatedly, providing data on short- and long-term temporal changes in concentrations of pollutant chemicals.

(8) They survive under conditions of pollution which often severely reduce or eliminate other species.

(9) They can be successfully transplanted and maintained on subtidal moorings or on intertidal shore areas where normal populations do not grow--most often due to lack of suitable substrate--thereby allowing expansion of areas to be investigated.

(10) They are commercially valuable seafood species on a worldwide basis. Therefore, measurement of chemical contamination is of interest for public health considerations.

The U. S. Mussel Watch Program: Implementation

A proposal, with Professor Goldberg as Principal Investigator, was forwarded in mid-1975 to the U. S. Environmental Protection Agency via Dr. Eric Schneider, then Director of the U. S. EPA Environmental Research

Laboratory, Narragansett, Rhode Island. Funding was secured to begin collections in 1976. This project was treated very much as a research project because (1) several of the measurements proposed for the program were in the early stages of analytical chemistry development and could be accomplished in only a few laboratories at that time and (2), as will be illustrated later, interpretation of the results required close coupling with past and ongoing research in the participating investigators' laboratories.

The principal investigators involved in the project and the collective of chemicals chosen for measurement are given in Table 1. Two laboratories were initially chosen for each type of chemical to be measured in order to provide for redundancy in case a given laboratory ran into analytical problems, to provide an interlaboratory check on data, to explore different approaches to new methodologies, and to reduce the burden of analyses for a given laboratory. In several cases the analyses of the entire national collection for a given year could not be undertaken in a single laboratory without severely disrupting several important ongoing research programs. The choice of chemicals to be measured was based on obtaining data for representatives of several of the major classes of chemicals of environmental concern and for which methodology was available or could be available after a few months of research. Chemicals of environmental concern were those that can or may have an adverse effect on marine biota in the coastal area or those which could represent a human health problem if accumulated to elevated concentrations in marine biota consumed by people.

The sampling locations for the first year of the program, 1976, are shown in Figure 1. Some changes in locations were required in 1977 and 1978 due to changes in bivalve population densities, accessibility to collection sites, or the need to add stations because of special concerns with a given location.

The sampling locations were chosen by applying several criteria. We required stations near the major urban coastal areas; stations in remote, low population density, relatively pristine areas; and stations in areas of the coast which were neither obviously urban nor in pristine areas. Populations had to be large enough to sustain repeated sampling over the years. Each sampling required over 400 individual bivalves for the various analyses. With only a few exceptions, access had to be relatively easy because of initial budget restraints for collection. Populations had to be stable and have a history or promise of maintaining themselves over a period of several years to provide a time course of measurements for a given location. Several stations were chosen to be near coastal areas where nuclear power plants were sited or near river mouths or estuaries with nuclear power plants sited upriver. We sought and received valuable advice on station selections from colleagues at federal, state, and private marine laboratories and oceanographic research centers around the United States. Many more stations were proposed than could be accommodated within funding restrictions.

Stations finally chosen were generally on the outer coast, at the mouths of estuaries or in a few selected harbor areas such as San Diego and Boston. The sampling was designed to support an assessment of regional or temporal trends in chemical pollution on the outer coast of the United States. Since several estuaries such as Chesapeake Bay and Narragansett Bay were the sites of ongoing research programs for the cycles of several chemical pollutants, estuaries were not extensively sampled, even though we recognized that pollution often increased in severity on transects from the mouths to heads of estuaries for urban areas.

Each year a team of two collectors traversed the entire U. S. coast collecting samples. This collection by a single group, supplemented by a few local collections by the principal investigators, ensured uniformity of collection and site description procedures and also ensured that samples were not compromised during the collection and shipping process. The samples were stored in a freezer in a trailer and periodically shipped frozen to the laboratories for analysis. In a few cases, the locations of suitable oyster reefs for sampling were zealously protected by commercial fishermen and we had to purchase samples from them.

Two locations were chosen to measure seasonal and monthly fluctuations in concentrations of chemicals. We knew from published data that body burdens of chemicals could be influenced by spawning activity and changes in metabolism related to fluctuations in habitat temperature. Thus, we needed these data sets to constrain the larger national data set where samples could only be collected yearly, initially, because of funding constraints. The sampling sites chosen for the monthly samples were Bodgea Head, California (*Mytilus californianus*), a remote, relatively pristine site; and upper Narragansett Bay, Rhode Island (*Mytilus edulis*) at a moderately polluted site. These data will not be discussed here, but we have used them to interpret the national data sets for this program.

The analytical chemistry methodology is also beyond the scope of this article. However, it is important to note that the measurements are trace constituent measurements. Concentrations of the chemicals measured are in the parts-per-million to parts-per-billion range or even less. We are often asked, "Why measure concentrations at such low levels that they might have few, if any, adverse effects on marine biota and are well below U. S. Food and Drug Administration action levels for restricting human consumption?". The answer is in three parts. First, we should be capable of detecting trends of increasing concentration and geographical locations of increasing coastal environmental burdens of real and potential chemical pollutants well before they reach levels having an adverse impact or before they become a threat to seafood consumers. This early warning will allow for more calmly considered remedial action and protection strategies compared to the many costly, rearguard, firefighting-type activities of remedial action of the past decade, typified by present Superfund hazardous waste programs. Second, we will be able to detect the response of the coastal environment to the reduction in inputs of chemicals such as polychlorinated biphenyls (PCBs), for which production has ceased in the United States; or lead, for which regulatory action has decreased the amount of tetraethyl lead in gasoline, thereby decreasing inputs to the environment from automobile exhausts. Third, we are learning important lessons from present distributions and cycling of chemical contaminants that will assist us in predicting the behavior of man-made chemicals which might be released to the environment in the future. This forms part of the knowledge which is used along with toxicity studies to determine if a particular chemical should be released to the environment and, if so, how much and in what manner.

Results and Interpretations for the U. S. Coast

The many facets of the results and interpretations of the first three years of the program are too numerous to mention in detail here. A preprint of an overview publication now in press in Environmental Science & Technology is attached. This paper contains an updated list of references. A brief synopsis of a few examples of data and interpretations will be presented.

Polychlorinated Biphenyls

These chemicals are produced by chlorination of the biphenyl molecule which theoretically can produce mixtures of up to 200 individual chemicals. Most commercial mixtures contain a more limited array of 50 to 100 individual chlorinated biphenyls. The mixtures of PCBs have many uses because they have high stability, low water solubility, low volatility, high dielectric constant, and are non-flammable. PCBs have been used in open systems in hydraulic fluids, heat transfer fluids, lubricating and cutting oils, paints (including boat paints), inks, sealants, and resin extenders. PCBs have been used extensively in closed systems as dielectrics in transformers and large capacitors in electrical systems. The main point is that PCBs had and have pervasive use throughout industrial societies such as the United States.

Environmental and human health problems with PCBs were responsible for a cessation of open systems use of PCBs around 1972 and a cessation of production in the United States in 1977. Despite these actions, much of the PCBs produced were still in use or in various disposal and landfill areas as of the time of a study by the National Academy of Sciences, published in 1979. The situation has probably changed very little since then, although some effective cleanup programs are now in progress for large closed systems and for some of the contaminated disposal sites.

Figure 2 provides data for the U. S. west coast samples of the Mussel Watch program. There is no significant difference in the data from 1976 to 1977 to 1978. The differences between concentrations at a given station from one year to the next are within the expected differences noted for analytical measurements and expected temporal variability based on the Narragansett Bay and Bodega Head data sets.

Given the types of uses previously discussed and disposal practices of the 1950s to 1980s, we would expect some areas of elevated PCBs near urban centers. Indeed, that is what we find on the west coast of the United States (Figure 2), with elevated PCB concentrations near San Diego, San Pedro (Los Angeles), and San Francisco, with much lower concentrations in samples from the more pristine, less populated areas of the northern California, Oregon, and Washington coasts. These findings are the same for the east coast (Figure 3), where we find that there is a "Northeast Megapolis Effect" of elevated PCB concentrations associated with the highly populated and industrialized northeast coast.

The data also show a sample in 1978 for the Acushnet River Estuary-New Bedford Harbor area mussels (Figure 3), clearly identifying this area as a "hot spot" of PCB pollution. A follow-up to these and other measurements by a combination of federal, state, and academic laboratories has clearly shown this site to be heavily polluted with PCBs as a result of releases to the harbor area by two electrical component manufacturing companies. In 1982, this area was designated a Hazardous Waste Superfund Site by U. S. EPA and a Remedial Action Master Plan for PCB pollution abatement in the area is now in the final stages of formulation.

We found that the plot of data such as that shown in Figure 3 was compelling and convinced several local and state elected and appointed officials that this site was severely contaminated in comparison to several other areas on the U. S. coast and deserved further immediate attention. This is one value of a regional and national data set. It provides one means of comparison for identifying areas for special concern.

Only the Acushnet River Estuary-New Bedford Harbor mussels contained PCB concentrations close to or in excess of the 5 ppm wet weight* concentration set by the FDA as a recommended upper limit for seafood for human consumption. It is sobering to note that the cessation of open use and production of PCBs were implemented none too soon for the protection of a sizeable area of the northeastern U. S. coast and other urban areas on the coast from PCB concentrations in bivalves in excess of the FDA limit. Our data is not as complete for the Gulf coast as it is for the east and west coasts, but the analyses to date in the Gulf coast area are consistent with general conclusions from the other coasts.

Lead

Lead data for the U. S. west coast are presented in Figure 2. Lead concentrations are elevated near the southern California urban areas of San Pedro Harbor (Los Angeles) and San Diego. The high lead concentrations near these areas have been linked with atmospheric inputs and sewage, storm, river, and coastal runoff contributing lead from combustion of lead compounds in gasoline. Elevated values for lead were also noted in a few samples from around the New York and Boston areas. However, oysters sampled near urban areas of the southeast and Gulf coasts did not have elevated concentrations compared to remote, less populated areas. The reasons for this difference are unknown at this time. Lead, unlike PCBs, has a natural source in the environment and anthropogenic discharges are adding to a natural background of lead. The value of systematic measurements of lead in bivalves from a variety of types of coastal areas is to provide a relative assessment of natural versus man-mobilized lead burdens in coastal biota.

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* An average wet weight to dry weight ratio is 8 to 1.

Fossil Fuel Hydrocarbons

There are a variety of sources of input of fossil fuel hydrocarbons to coastal areas. These range from oil spills to chronic dribbling of oil via sewage, urban runoff, industrial effluents, and combustion of coal, oil, and gasoline. Polycyclic aromatic hydrocarbons (PAH) are part of the fossil fuel compound assemblage, and several of the PAH are of concern because they can have adverse impacts on biota depending on concentrations, duration of exposure, and the particular species in question. Other PAH are known or suspected mutagens and carcinogens. Thus, the route back to man from various inputs and the current status of PAH concentrations in marine biota are important for public health considerations. In brief, the Mussel Watch data showed elevated concentrations of fossil fuel compounds near urban areas in comparison with remote rural areas. This was expected, although the exact details of distributions were not known, and the measurements provided the needed confirmation.

There was a surprise in some of this hydrocarbon data. Previous measurements of polycyclic aromatic hydrocarbons had been made in sediment samples from several U. S. coastal areas--particularly the northeastern United States. Polycyclic aromatic hydrocarbons are present in crude oils, fuel oils, and in particulates released during combustion of coal, oil and gasoline. There are distinct chemical composition differences between the combustion source compound mix and the crude oil-fuel oil compound mix. The combustion source PAH predominate in sediments near urban areas where elevated concentrations are found. These PAH are also present at much lower concentrations in sediments in remote areas. However, the mussels with elevated polycyclic aromatic hydrocarbon (PAH) concentrations near urban areas had a mixture of PAH with a composition indicative of either a mixture of combustion source PAH and petroleum PAH or, more often, a predominance of PAH from petroleum sources--crude oil or fuel oil spills or chronic petroleum release in effluents and urban runoff.

We do not have a complete explanation for this as yet. However, the working hypothesis we are currently testing is as follows. The petroleum compounds are probably more available for uptake by bivalves compared to the compounds from combustion sources. We think this is a result of the stronger binding of the combustion source PAH to particles released from combustion sources. Chemical extractions used for sediment analyses would remove these PAH from the particles. Mussels and oysters probably ingest combustion source PAH particulates during feeding but pass them through their digestive systems with minimal uptake. In comparison, petroleum source PAH are present in the habitat of bivalves in dissolved or dispersed form in the water, or not tightly bound to particulate matter. These petroleum source PAH would be more readily available to uptake from water across gill surfaces or during feeding on particulate matter.

Thus, analyses of sediments primarily records the overall geochemical cycle of PAH in the coastal environment, while the bivalves provide a better assessment of that portion of the PAH available for uptake by biota. We do not propose absolutes. Some of the combustion source PAH are taken up and a small portion of the petroleum PAH are probably not available for uptake. Further studies to confirm or modify this hypothesis are in progress.

There are important implications of this for pollution abatement policies. Until recently it was thought that one of the more significant sources of PAH input to the coastal environment was combustion of fossil fuels. Petroleum inputs from previously discussed sources were thought by some to be quantitatively less important. In considerations of pollution abatement in coastal areas, greater consideration might be given to combustion sources in order to reduce the potential for long-term adverse effects. The hypotheses we have set forward using the combined interpretation of Mussel Watch and sediment analyses data suggest that we might focus more attention or equal attention on reducing petroleum PAH inputs. At the very least we need to study this situation which is easily amenable to experimental testing of our hypothesis.

Comparison of PCB, Lead, and Fossil Fuel Hydrocarbon Data

PCBs, lead, and fossil fuel hydrocarbons are elevated in concentrations in bivalves near most large urban areas we have studied. Despite this general coincidence, there is not a strict one-to-one correlation of elevated concentrations for these chemicals because the mechanisms of release to the environment are different. There are natural backgrounds for lead and fossil fuel hydrocarbons, and the biogeochemistries of these chemicals are sufficiently different in details that they sometimes move through coastal environments at different rates.

In the United States, both lead and PCBs are subject to regulations which are intended to reduce and restrict the anthropogenic inputs to the environment. Lead content in gasoline has been reduced and debate continues as to the need for further reductions. PCBs are no longer manufactured in the United States. PCB use in open systems is banned and recovery of PCBs from large contained uses is in progress. There is no evidence in our data of reductions in lead and PCB concentrations between 1976 and 1978, a period of time during which regulatory actions for lead and PCBs were implemented. This results from the fact that anthropogenic inputs from previous years were and are still in the coastal biogeochemical cycles; particularly, the sediment reservoirs in urban harbors and estuaries. It may be another five years or more before definite indications of large-scale reductions of lead and PCB concentrations, compared to the 1976 data, will occur in the U. S. coastal regions. However, the existence of the 1976 to 1978 data will allow us to assess the rate and extent of reduction in response to regulatory action.

Plutonium

Plutonium isotopes are man-made radioactive chemicals and enter the environment during nuclear weapons testing or from leaks during the nuclear fuel cycle. Measurements are conventionally expressed as dpm (disintegrations per minute), which are a function of radioactive decay and are proportional to the amounts of plutonium present. The data for two of the most common plutonium isotopes which were combined in the Mussel Watch analysis techniques are presented in Figure 4 for west coast samples. There are elevated concentrations in the Central California coastal areas, although the concentrations are very much lower than those which would be of immediate concern from a public health perspective. The geographic coincidence of the elevated plutonium concentrations with the general location of the radioactive waste canisters dumped to the seafloor off the Fanalon Islands caused some who had access to the unpublished Mussel Watch data to prematurely conclude that plutonium released from the disposal site was reaching surface waters. That conclusion was incorrect.

Data from long-term, ongoing research programs in Professor Goldberg's and Dr. Bowen's laboratories, as well as other laboratories, had clearly shown that a portion of plutonium from the nuclear weapons testing fallout of the 1960s was present in higher concentrations in mid-depth North Pacific waters (500 to 1,000 meters) compared to lower concentrations in surface waters and deeper waters. Research off the coast of California by several scientists including Dr. John Martin, who was a principal investigator in the Mussel Watch program, had shown that Cd was actively mobilized during cycles of upwelling of coastal waters. Elevated Cd concentrations in some of the mussel samples in the region are attributed to more intense upwelling off the Central California coast compared to areas to the north or south (Figure 4). The best evidence available shows that upwelled water from about 500 to 1,000 meters is supplying elevated plutonium concentrations to the Central California coastal surface waters, and the mussels are reflecting this increase in concentration.

Concentrations of plutonium for the entire east coast mussel and oyster collections were similar to the concentrations for the Oregon and Washington coasts and for the Southern California coast. All the man-made radionuclide data for the U. S. Mussel Watch samples showed no evidence of local or regional systematic elevations of environmental concentrations as a result of effluent releases from nuclear power reactors. The data are all consistent with knowledge of the biogeochemical cycles of worldwide fallout from nuclear weapons testing.

Two important points are illustrated by the plutonium data and interpretation. First, national and regional surveys on a systematic basis were needed to clearly identify elevated concentrations of plutonium in mussels of the central California coast. Second, a close coupling of oceanic research with these prototype monitoring measurements was essential to correct interpretation of the data.

A further illustration of the importance of having these systematic surveys is a consideration of the "what-if" scenarios surrounding the Three Mile Island nuclear power plant incident. The U. S. Mussel Watch program had been in progress and collections of samples and initial data for the east coast were already available prior to that incident. If there had been substantial release of nuclear fuel radioactive chemicals with a concomitant concern about transport through the environment and along the coast then the Mussel Watch collections and data could have provided a sensitive benchmark for survey of any releases from Three Mile Island.

Continuing Activities and A Perspective

Further limited collections and analyses of samples from the California coast, monthly collections from Narragansett Bay, RI; Bodega Head, CA; and Beaufort, NC; and from northeast U. S. coast sites have been completed since 1978 or are in the final stages. Considerable research has been focused on refining the relationship between concentrations of chemicals in mussels and concentrations in the water and sediment of their habitat.

There has also been an emphasis on two aspects of analytical chemistry methods: intercalibration of measurements between laboratories and identification and more accurate quantitative measurements of the myriad anthropogenic petrochemical compounds and pesticides released to the environment and present in shellfish samples.

The intercalibration efforts are required to provide a framework within which interpretation of data for the same chemicals but from different laboratories can be compared and interpreted. Many of the methods of measurements of low concentrations of chemical pollutants are new and it is essential that these methods are checked very carefully. The details of these exercises would be dull reading for most people. However, these measurements are very difficult and demanding and require constant checks to ensure high quality data. There are national and international intercalibration exercises. Our laboratory is presently preparing subsamples of a mixture of a puree of tissues from over 4,000 mussels for distribution to laboratories of our U. S. colleagues and colleagues in other countries as part of a joint ICES (International Council for the Exploration of the Seas)-IOC (International Oceanographic Commission of UNESCO) intercomparison exercise funded by NOAA and IOC. This is part of a continuing series of exercises which are bringing us to the point where we will be able to compare our data with data from other countries to provide a wider ranging global perspective of chemical contamination in coastal waters.

PCBs, DDT, and polycyclic aromatic hycrocarbons are only a few of the thousands of petrochemicals produced over the years. A large number of trace impurities and side reaction chemicals are also produced. Many of these chemicals leak or are deliberately discharged to the environment. Once released, a complicated series of reactions are possible and can result in transformation of these compounds into other compounds.

Fortunately, the incidences where the initially released compounds or their reaction products are of concern from the perspective of adverse impacts on biota and, more specifically, a threat to the health of man, are relatively small. Depite the greater attention to environmental concerns and increase in knowledge of fate and effects of pollutants in the environment, we must guard against the surprises that cropped up during the past two decades.

The signals from our analytical instruments such as the gas chromatograph-mass spectrometer systems record the presence of hundreds of chemicals of unknown identity in the mussel and oyster samples. Many of the chemicals are of natural origin, but many others are only present or primarily present in samples near urban industrial areas. Are a few of these new compounds of future environmental concern? Research is in progress to minimize the chance of society being taken by surprise by the build-up of an unrecognized environmental pollutant. Modifications of computerized identification and data systems are being pursued to enhance analyses, data filing, retrieving, and display in order to keep track of more of the petrochemicals released to the environment and recorded in bivalve tissue.

Another important segment of the U. S. Mussel Watch program has been the maintenance of a frozen set of archive samples from the national collection sites for 1976 to 1978. There is no doubt that analytical methods of measurement are improving at a rapid rate and new instruments with greater selectivity and sensitivity are being developed. The archived samples allow the possibility of retrospective analyses of collections in 1976, 1977, and 1978. When new compounds of concern are identified and a time course of the build-up of coastal ecosystems burdens of these compounds are desired, the archived samples can be analyzed.

Bivalve sentinel organisms programs have been in progress in other countries, for example, the United Kingdom, the Netherlands, France, Spain, Australia, Japan, for the same period of time and, in some cases, earlier than in the United States. Researchers from many countries met in December of 1978 in Barcelona, Spain under the auspices of the Environmental Studies Board of the U. S. National Academy of Sciences under contract from U. S. EPA to exchange ideas and evaluate the state-of-the-art at that time. A similar meeting is scheduled for the East-West Center in Hawaii in November of this year, sponsored by SCOPE and by IFIAS (International Federation of Institutes for Advanced Studies). The United Nations via organizations such as IOC-UNESCO and the U. N. Environment Program is evaluating the use of the sentinel organism programs in pilot programs of assessing environmental quality in coastal areas.

The U. S. Mussel Watch activities have been coordinated over the past several years with the CEAS (Coastal Environmental Assessment Stations) program of the Environmental Research Laboratory, Narragansett, U. S. EPA. The CEAS program under the leadership of Dr. Donald K. Phelps of EPA has been extensively investigating the use of mussels transplanted in cages hung on moorings along a gradient of chemical pollution in Narragansett Bay. The caged musels are analyzed for trace metals, PCBs, and petroleum hydrocarbons in the same manner as the national Mussel Watch collection. In addition, Dr. Phelps and his co-workers have made physiological measurements of the health of these mussles using techniques developed over the past several years by a wide range of marine biologists--notably Dr. Brian Bayne of the Institute of Marine Environmental Research in Plymouth, England. This has extended the concept of sentinel organisms into the biological effects arena. The combination of chemical and biological measurements provides powerful tools for assessing the status of environmental quality in coastal waters.

We have made use of the transplant mussel cages in further assessments of the extent and severity of PCB pollution in the western part of Buzzards Bay as a result of the Acushnet River Estuary-New Bedford Harbor PCB problem discussed earlier. Dr. Phelps and co-workers are now extending the transplant concept into studies of nearshore dump sites for harbor dredge spoils and sewage sludge.

There are several other activities of a similar nature, completed or in progress, where the sentinel organism concept using bivalves has been or is being used in research and monitoring activities. The Southern California Coastal Water Research Project applied many aspects of the concept to studies of the Southern California Bight in the time period 1972-1976. Mr. Philip Butler of the U. S. EPA was an early pioneer and used the concept in the late 1960s to assess the extent of DDT pollution in several regions of the U. S. coast. California now has a state Mussel Watch operational monitoring program.

Summary

The Mussel Watch concept must not be viewed as a panacea for understanding all important aspects of the biogeochemistry of pollutant chemicals in coastal areas. The U. S. Mussel Watch program was a prototype for one approach to monitoring for chemical pollutants. It yielded data usefully interpretable within the context of knowledge of biogeochemical processes gained from research. This latter point is a crucial consideration for future monitoring efforts. The close coupling between research and monitoring was very important to interpretation of data, as was illustrated by the discussion of the plutonium data and the polycyclic aromatic hydrocarbon data."

Oceanus quotation and paraphrase ends.

TABLE 1.

MUSSEL WATCH - PRINCIPAL INVESTIGATORS AND CHEMICALS MEASURED

DR. EDWARD D. GOLDBERG SCRIPPS INSTITUTION OF OCEANOGRAPHY GEOLOGICAL RESEARCH DIVISION LA JOLLA, CALIFORNIA	PRINCIPAL INVESTIGATOR OF THE PROJECT. RADIONUCLIDE ANALYSES, E.G., PLUTONIUM ($^{239, 240}$Pu, ^{238}Pu, ^{137}Cs, ^{241}Am) AND TRACE METAL ANALYSES, E.G., COPPER, ZINC, NICKEL, SILVER, LEAD, CADMIUM
DR. VAUGHAN T. BOWEN WOODS HOLE OCEANOGRAPHIC INSTITUTION WOODS HOLE, MASSACHUSETTS	RADIONUCLIDE ANALYSES, E.G., PLUTONIUM ($^{239, 240}$Pu, ^{238}Pu, ^{137}Cs, ^{241}Am)
DR. JOHN W. FARRINGTON WOODS HOLE OCEANOGRAPHIC INSTITUTION WOODS HOLE, MASSACHUSETTS	HALOGENATED HYDROCARBON (PCB AND DDT)[1] AND HYDROCARBON ANALYSES
DR. ROBERT W. RISEBROUGH BODEGA MARINE LABORATORY UNIVERSITY OF CALIFORNIA BODEGA, CALIFORNIA.	HALOGENATED HYDROCARBON (PCB AND DDT) AND HYDROCARBON ANALYSES (PETROLEUM)
DR. JOHN H. MARTIN MOSS LANDING MARINE LABORATORY MOSS LANDING, CALIFORNIA	TRACE METAL ANALYSES (AS ABOVE)
DR. PATRICK L. PARKER MARINE STATION UNIVERSITY OF TEXAS PORT ARANSAS, TEXAS	HYDROCARBON ANALYSES (PETROLEUM)
DR. JOHN LASETER CENTER FOR BIO-ORGANIC STUDIES UNIVERSITY OF NEW ORLEANS NEW ORLEANS, LOUISIANA	PARTICIPANT IN THE INTERCALIBRATION EXERCISE (HYDROCARBONS AND PCBS)
MR. WALTER GALLOWAY, DRS. DONALD K. PHELPS, JAMES LAKE, PETER ROGERSON	COORDINATORS OF INTERCALIBRATION EXERCISES, 1979-1980 (TRACE METALS, HYDROCARBONS, PCBS)

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[1] DR. GEORGE R. HARVEY, NOW AT THE ATLANTIC OCEANOGRAPHIC AND METEOROLOGICAL LABORATORY, NOAA, MIAMI, FLORIDA, WAS A PRINCIPAL INVESTIGATOR DURING 1976.

Since 1978, the Mussel Watch program has been severely reduced in scope and funding. The U. S. Mussel Watch program has not made a national collection since 1978 due to funding cuts. It is my understanding that the program will end in the next several months. We are presently assembling our latest data for a final report in the fall of 1983. Active sample collection and analyses were stopped in April of 1983.

The participants in the program were led to believe, to the best of my recollection, that we would be involved in 1980 to 1981 in a period of "technology transfer" of the prototype to an operational monitoring program in a government laboratory or laboratories or contracting laboratories. In fact, two meetings of Mussel Watch program participants and selected federal agency officials were convened to facilitate this transfer.

Despite these explicit efforts, an operational national program for monitoring chemical pollution of living marine resources in coastal areas does not exist. I am not privy to most federal agency policies and decisions in regard to this issue. Thus, I can only speculate that this situation is due to a combination of the following:

(a) Lack of understanding of how to implement monitoring in support of national policy objectives for protection of the marine environment.

(b) Fluctuating signals from administrative officials high in the policy-making and implementation sections of federal agencies such as NOAA and EPA in regard to the national policy objectives for marine environmental quality.

(c) Lack of agreement among federal agencies as to which agency has responsibility for funding monitoring of the quality of the marine environment.

(d) A general lack of sufficient funds.

(e) A natural, but regrettable, tendency for some federal agency officials and some federal agency scientists to protect internal agency laboratory programs at the expense of new programs, either internal or external.

RECOMMENDATIONS

THERE IS A NEED FOR MUCH MORE INTERACTION BETWEEN SCIENTISTS, ECONOMISTS, SOCIOLOGISTS, LAWYERS, AND OTHERS TO FORMULATE REGULATIONS WHICH IMPLEMENT POLICY FOR PROTECTING THE MARINE ENVIRONMENT WITHIN THE FRAMEWORK OF WHAT IS REALISTIC AND ATTAINABLE GIVEN SCIENTIFIC KNOWLEDGE AND MEASUREMENT CAPABILITIES.

Those formulating regulations or programs need to recognize the scientific limitations for determining compliance with regulations. For example, the recommendation for a program of monitoring for oil pollution in seawater has generated debates about what to measure and how to measure it ever since the first International Oceanographic Commission (IOC)-UNESCO meeting of groups of scientific experts in 1974. This continuing debate can be seen by comparing the meeting document in 1974 with a recent (1982) IOC report by an ad hoc group of experts. The source of the problem is based on the fact that petroleum is an extremely complex mixture of chemicals--as many as 10,000 or more chemicals in crude oils. The debate is primarily between proponents of the less expensive and less specific analytical method involving a higher degree of uncertainty in the data, and the proponents of the more expensive, highly specific analyses with a greater degree of certainty. The analogy in legal terms is whether or not there needs to be sufficient evidence, a preponderance of evidence, or evidence beyond a reasonable doubt.

Another related problem has been addressed by several different scientists. My version is quoted from a recent paper I presented to the Law of the Sea Institute Conference in June of 1982.

"We need to bring a more realistic approach to the interface between marine pollution research and public policy and regulations without sacrificing the integrity of the scientific method. Too often, environmental scientists find themselves in the uncomfortable position of not having sufficient information to make a prediction; that is, draw a conclusion which will stand the test of time for an environmental pollution concern. The general public and one's scientific colleagues usually treat predictions in the general field of environmental pollution as based on the precepts of the scientific method. If you do not have data to substantiate a prediction beyond a reasonable doubt, you do not make one. However, decisions often must be made concerning some marine pollution problems without having all the evidence. Should we allow scientists to make their best estimates if these estimates are clearly labelled as such by the scientists? Should scientists be willing to make such estimates? Some of my colleagues would say that the consequences are too great if a mistake is made with a 'guesstimate' by a scientist who has sold out to expediency. My reply is that physicians, economists, politicians, and military commanders make their best estimates every day and the consequences of their mistakes can be as devastating as a wrong estimate by scientists engaged in environmental quality research."

THERE IS AN OBVIOUS PRIORITY NEED FOR CLOSE COLLABORATION AND COUPLING OF ENVIRONMENTAL RESEARCH AND ENVIRONMENTAL MONITORING ACTIVITIES.

This has been demonstrated by the examples of the interpretation of the plutonium data and the polycyclic aromatic hydrocarbon data.

THE UNITED STATES SHOULD MAKE A CLEAR COMMITMENT IN ACTION, NOT WORDS, TO PARTICIPATION IN INTERNATIONAL MARINE POLLUTION MONITORING PROGRAMS.

I have been a U. S. representative to the Marine Chemistry Working Group of the International Council for the Exploration of the Sea. This organization has several member nations from Europe where there are designated monitoring efforts aimed at measuring chemical pollution of coastal areas. The lack of a coordinated, on-going U. S. program was apparent at the recent (February 1983) meeting in Copenhagen. When asked by the staff officer for names and addresses of U. S. laboratories involved in national coastal monitoring programs for chemical contaminants, I had to reply that, as far as I knew, there were no "national" programs, only small regional programs, one state program, and several local programs without any national coordination. Thre are numerous ways of diplomatically explaining this situation in terms of "planning underway to implement a coordinated effort" and "assessment of present methodologies appropriate to national as well as international needs". The stark reality is that the United States lacks substantive commitment to these programs, and scientists in Europe and elsewhere cannot be fooled by diplomatic niceties. This situation may be a true reflection of a deliberate policy of the Unites States. If so, it would seem reasonable to expect that delegates to these meetings should be informed of the policy.

THERE IS A NEED FOR LONG-TERM, SUBSTANTIVE COMMITMENT TO THE DEVELOPMENT, PRODUCTION, AND DISTRIBUTION OF STANDARD MATERIALS FOR ENVIRONMENTAL MONITORING PROGRAMS. COMPARISON AND INTERPRETATION OF DATA FROM DIFFERENT LABORATORIES ARE SEVERELY HAMPERED BY LACK OF COMPARABILITY BETWEEN SETS OF DATA.

There are numerous intercomparison exercises in progress or which have been completed. Data from these exercises show variability in data from different laboratories. Differences of a factor of 10 in analyses of splits of the same sample are not uncommon. Certainly progress has been made, but progress has been limited compared to the obvious needs. For example, I am distressed to say that there are no standards available from the National Bureau of Sandards for me to verify the accuracy of the Mussel Watch data for hydrocarbons and PCBs produced in my laboratory. NBS scientists are aware of these problems and have been allowed to work on the problems. However, funding for their work in this area has been sporadic.

There has been some substantial progress in this area of intercomparison exercises and assuring better comparability of data, but we need to keep up the momentum.

DATA ACQUISITION, ARCHIVING, AND RETRIEVAL CAPABILITIES HAVE NOT BEEN IMPLEMENTED TO THE EXTENT WHICH IS NEEDED AND POSSIBLE GIVEN CURRENT TECHNOLOGIES.

We have the capabilities for measuring many thousands of chemicals, as discussed earlier in this testimony. However, warnings in 1978 that work was needed on this aspect of monitoring were largely ignored by NOAA, which received a proposal to rectify this situation in 1978 and 1979.

MONITORING EFFORTS MUST BE IMPLEMENTED WITH THE FULL KNOWLEDGE OF THE COMPLEXITY OF NATURE AND MAN'S INTERACTIONS WITH NATURE. WE MUST CURTAIL EXPECTATIONS THAT ONE TYPE OF MEASUREMENT WILL REVEAL ALL WE WANT TO KNOW.

The Mussel Watch program has often been criticized by scientists and regulators because it did not provide an assessment of ecological effects and effects of pollutants on species of organisms. The program was never intended to assess effects of pollutants, as I have explained in a previous section of this testimony.

This is symptomatic of the desire for simplicity on the part of regulators. The best analogy I can present to illustrate the problem is the role of measurements and clinical laboratory tests in medicine. If a patient has a temperature above normal, then the physician will request a variety of clinical tests such as blood chemistry, urinalysis, and X-rays. However, not all human diseases are expressed by elevated body temperatures. Often, physicians need results of a variety of sophisticated measurements in order to diagnose a disease. In many ways, environmental monitoring measurements are the same. We certainly know enough not to raise the temperature of coastal waters too high or to cause oxygen content to decrease drastically, or we will have dead organisms floating around. The debates are not about such drastic excesses. We can measure temperature and oxygen very accurately and discern subtle trends well in advance of drastic impacts.

The debates now evolve around subtle, long-term, chronic releases of chemicals and biological agents (e.g., viruses) to the environment and the long-term individual and collective impacts.

WE NEED TO FOSTER BETTER RESEARCH ON ECOSYSTEMS TO UNDERSTAND NATURAL VARIABILITY IN ECOSYSTEMS AND HOW TO DISCERN POLLUTANT IMPACTS. IN MANY CASES THIS WILL REQUIRE LONG-TERM (MANY YEARS, EVEN DECADES) DATA COLLECTION WITHIN THE FRAMEWORK OF SCIENTIFICALLY RIGOROUSLY-DEFINED PROGRAMS.

TO ACCOMPLISH THE PRECEDING, WE NEED TO FOSTER A BETTER SPIRIT OF MEANINGFUL COOPERATION BETWEEN ALL SEGMENTS OF THE SCIENTIFIC COMMUNITY, GOVERNMENT, ACADEMIC, INDUSTRY, AND CONSULTING COMPANIES.

THERE NEEDS TO BE A CLEAR DECISION AND ASSIGNMENT OF AUTHORITY AS TO WHICH AGENCY IS IN CHARGE OF MARINE POLLUTION RESEARCH AND MONITORING, AND THEN THAT AGENCY SHOULD RECEIVE THE FUNDS TO CARRY OUT THE PROGRAM.

My impression at this time, based on service with various agency committees and reading of government reports, is that authority for a particular problem often seems to be assigned to one agency, expertise to deal with the problem is in a second agency, and the funds to do the work are in a third agency. The end result is a series of interagency transfers, pass-through funds, and confusion. I marvel that Congress can keep track of who is responsible and how effectively the allocated funds have been spent. Indeed, it is difficult to understand how a comprehensive budget is even formulated.

The existence of a National Marine Pollution Program Plan, as formulated by the Interagency committee on Ocean Pollution Research, Development, and Monitoring has certainly been an effective step in the right direction. However, implementation of planned activities is captive to continuing interagency rivalries and apparent empire-building within given agencies.

THE OPEN OCEAN--A NEGLECTED AREA. THE FOCUS OF MARINE POLLUTION RESEARCH AND MONITORING WITHIN THE U. S. HAS BEEN LARGELY AIMED AT COASTAL AND CONTINENTAL SHELF AREAS DUE TO THE MORE IMMEDIATE PROBLEMS IN THOSE LOCATIONS. HOWEVER, WE SHOULD MAKE PLANS TO PERIODICALLY ASSESS THE STATUS OF CHEMICAL POLLUTION IN THE OPEN OCEAN-DEEP SEA AREAS TO AVOID NASTY SURPRISES. At present, the only concerted effort of which I am aware that focuses in the open ocean is the Transient Tracers Program, aimed at understanding oceanic mixing and ocean-atmosphere exchange, particularly in regard to carbon dioxide and climate concerns.

CONCLUDING REMARKS

As you may gather from remarks made in the preceding, there are a number of areas of concern which have been brought to the attention of this committee. However, there are also some very important areas of progress. Pollution of our coastal areas could have been much worse. For example, it should be a cause for some satisfaction that the Mussel Watch data reveal no systematic or regional elevated concentrations of the very toxic chemical plutonium as a result of releases from nuclear power plants. This is the result of the long-term combined efforts of a cross-section of society, e.g., scientists, physicians, engineers, and politicians, building on knowledge of biogeochemical cycles of radionuclides in the environment and health effects. This allowed the assessment that releases of artificial radionuclides should be curtailed to avoid significant transfer back to man via biogeochemical cycles in the environment. The assessment stimulated regulations and enforcement procedures. The progress should be a source of encouragement, but we must not become complacent.

Thank you once again, Mr. Chairman, for the opportunity to present my testimony. I will be pleased to answer questions or submit further documentation to your committee.

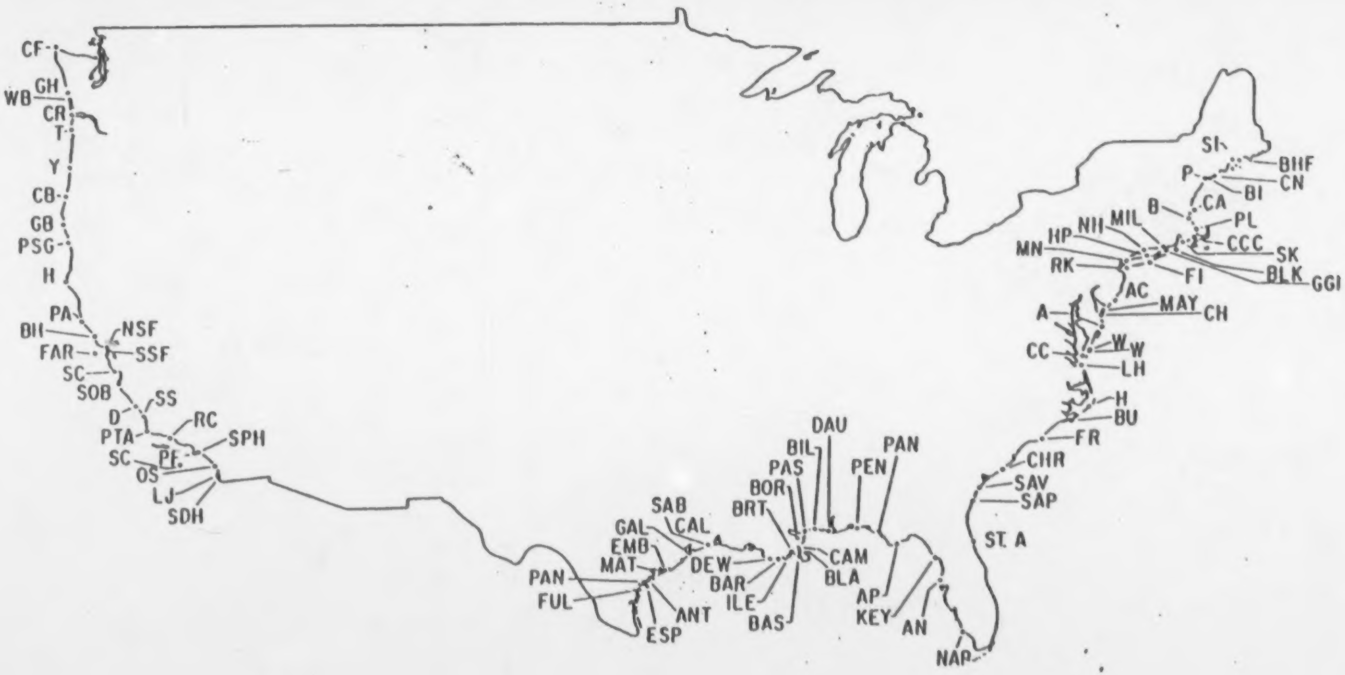
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Figure 1. U. S. Mussel Watch stations, 1976.

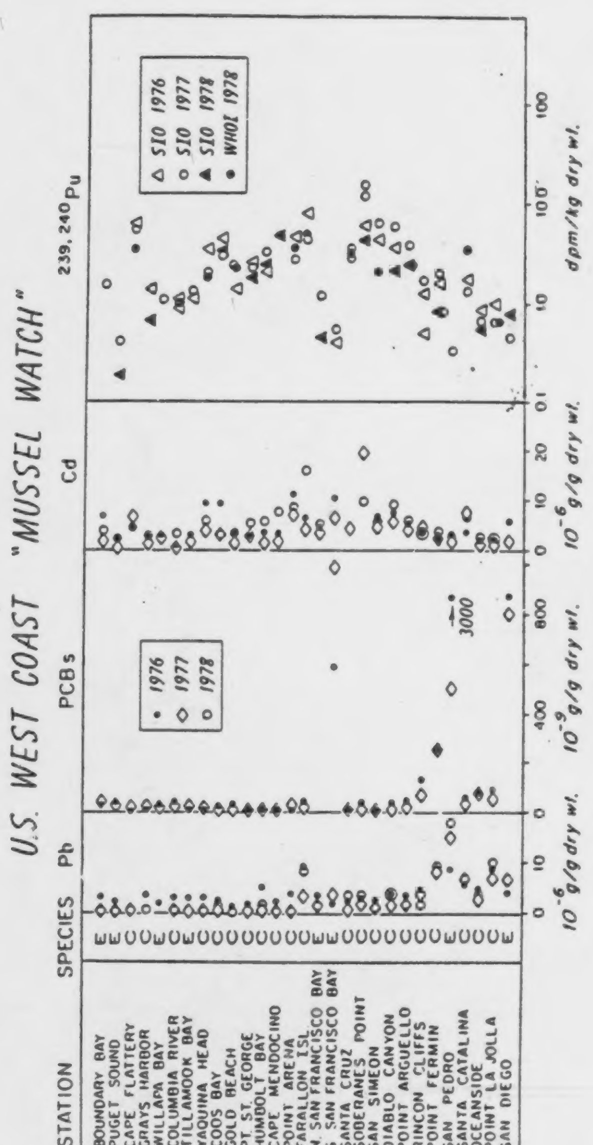

Figure 2. U. S. Mussel Watch data for the west coast, showing Pb and PCB data.

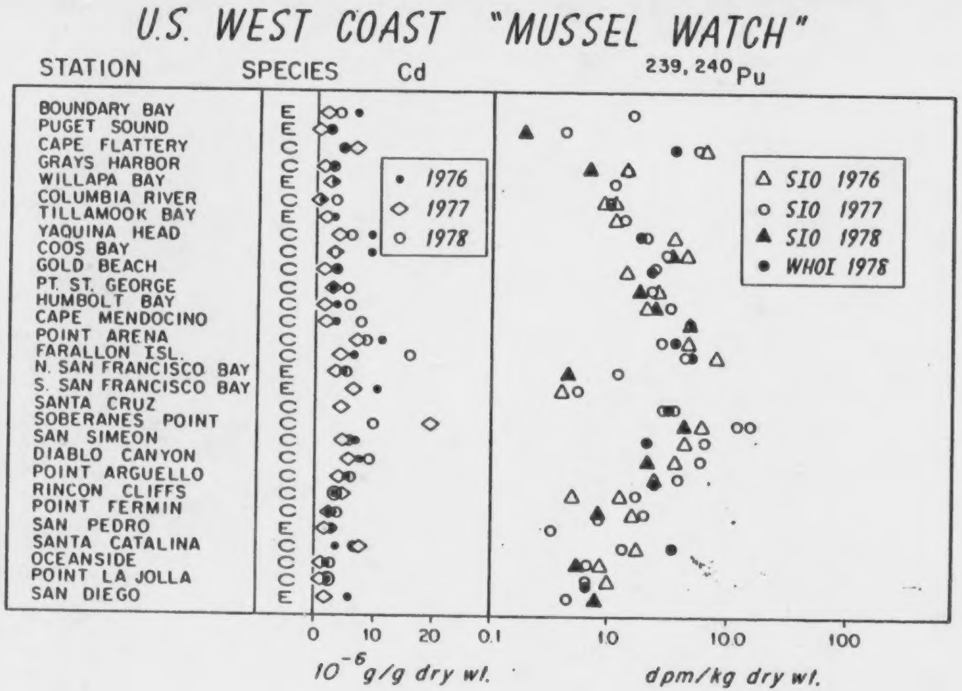

Figure 3. U. S. Mussel Watch data: East coast PCB data (and hydrocarbon data, not discussed).

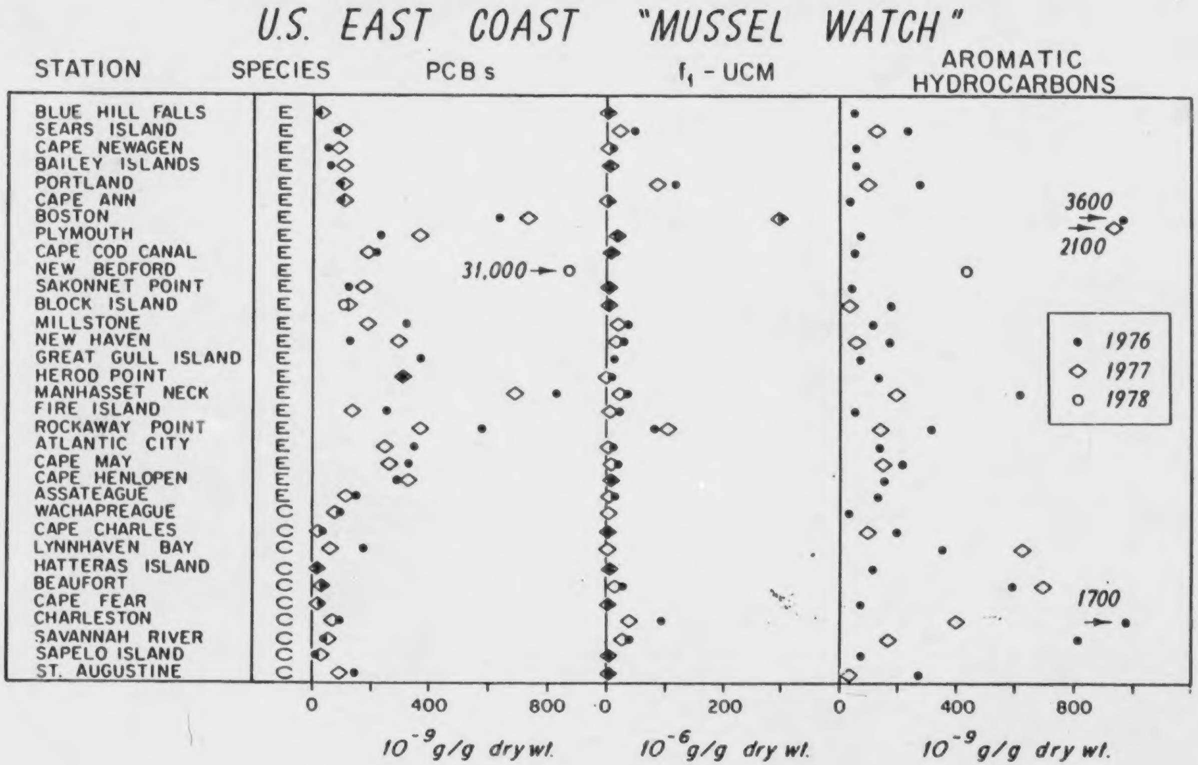

Figure 4. U. S. Mussel Watch data: West coast cadmium (Cd) and plutonium (Pu) data. Note logarithmic scale for x-axis of Pu data.

Mr. **Scheuer**. Very good.

All right. Now we will hear from Dr. Charles N. Ehler.

Dr. Schneider, are you going to address us after that?

Dr. **Schneider**. No, Mr. Chairman, but I will be available for questions.

Mr. **Scheuer**. You will be available for questions. Very good.

All right, Dr. Ehler.

STATEMENT OF DR. CHARLES N. EHLER, ACTING CHIEF, OCEAN ASSESSMENTS DIVISION, OFFICE OF OCEANOGRAPHY AND MARINE SERVICES, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE, ACCOMPANIED BY DR. ERIC D. SCHNEIDER, ASSISTANT TO THE ADMINISTRATOR FOR OCEANIC PROGRAMS

Dr. **Ehler**. I appreciate the opportunity to be here today to present the views of NOAA on environmental monitoring in estuarine, coastal, and open-shelf waters.

NOAA is currently attempting to construct together a coherent national ocean assessment program, including a new emphasis on marine monitoring. We are also placing a new emphasis on the synthesis of existing information with which to perform ocean assessments.

For example, we are currently developing, using data developed by EPA, the USGS, the Corps of Engineers, the Department of Agriculture, and other State agencies, a national database on pollutant discharges from all sources into marine waters of the Nation. We are organizing the best available information on the status and health of our coastal waters and plan to publish an atlas on this subject by the end of the next calendar year.

We are trying to develop a national program to assess status and trends in marine environmental quality. We are evaluating how existing monitoring efforts, such as the Mussel Watch Program just described by Dr. Farrington, could be integrated into a truly national program.

All of these efforts are focused on a series of objectives. I would like, very quickly to review those objectives with you. They are:

One: To assess long-term trends in environmental quality that can be detected only through repeated sampling over a number of years;

Two: To assess the cumulative, long-term environmental impacts resulting from multiple sources of pollution. The problem with site-specific studies, typically carried out through compliance monitoring programs, is that they are usually narrowly focused on a very small area, a few pollutant sources and a few selected contaminants. Only a long-term monitoring program can detect the gradual buildup of contaminants resulting from these many small events, each of which may be very inconsequential by itself;

Three: To assure that the regulatory framework for marine environmental quality management is actually working. We want to be able to guide this framework and make corrections based on the best available, national information; and

Four: To anticipate major environmental quality problems. Dr. Farrington called them "hot spots." We want to predict major changes in coastal and estuarine systems.

In my testimony I describe two NOAA programs of which I will spare you the details in my oral remarks today. They are the Northeast monitoring program and the microconstituents program and they incorporate aspects of marine monitoring that you should know the issue of.

What I will do is skip to one final point, quality assurance. You have heard from others who have testified that there is a problem of quality assurance in most monitoring programs. NOAA has placed a high priority on quality assurance, and the Administrator has recently established a quality assurance program to be conducted by all major line offices having to do with environmental monitoring and research.

This program will insure that measurements of toxic chemicals and pathogenic microorganisms made throughout NOAA and by our contractors are of a known quality and are adequate for their intended use.

In summary, I would assert that NOAA is prepared to provide the kind of national leadership that is necessary to bring together the substantive, but disparate and fragmented, efforts throughout the Nation to develop a national assessment capability for the marine environment.

Mr. Chairman, this is the end of my prepared remarks. Both Dr. Schneider and I would be happy to discuss any of these things further with you.

[The prepared statement of Dr. Charles N. Ehler follows:]

STATEMENT
OF
CHARLES N. EHLER
ACTING CHIEF, OCEAN ASSESSMENTS DIVISION
OFFICE OF OCEANOGRAPHY AND MARINE SERVICES
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH, AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

MAY 26, 1983

Mr. Chairman and Members of the Committee:

I appreciate the opportunity to appear before you today to present the views of the National Oceanic and Atmospheric Administration (NOAA) on monitoring environmental quality in estuarine, coastal, and open shelf regions.

With the objective of developing a coherent, national ocean assessments program, we are currently reviewing our existing data bases and assessment capabilities, including data from monitoring programs as well as use of information from developing satellite technologies. We are also placing new emphasis on the synthesis of existing marine monitoring data from both NOAA and a variety of other agencies. For example, we are developing -- using data available from EPA, the U.S. Geological Survey, the Corps of Engineers, the Department of Agriculture, and numerous state agencies -- a national data base on pollutant discharges from all sources (point, nonpoint, and upstream) into the coastal waters of the United States. We are also organizing the best available information on the status and health of our coastal waters and will publish a national atlas on this topic by the end of calendar year 1984.

Today I will highlight the status of two important marine environmental quality monitoring programs in NOAA. We are also currently evaluating the costs and utility of a national program to assess the status of and trends in marine environmental quality -- a program that would use existing monitoring data to develop new products for regional and national decisions on ocean resource use. All of these efforts are focused on a series of environmental-quality monitoring goals. I would like to share these goals with you and then describe some of NOAA's monitoring activities. Our goals in marine environmental monitoring are:

1. To assess long-term trends in environmental quality that can only be detected through repeated sampling over a number of years. Many changes in environmental quality are so slow or so subtle that intensive, short-lived research projects fail to detect them. Early detection of the processes of long-term deterioration is important in order to trigger research and management action before environmental impacts become severe;

2. To assess the cumulative, long-term, environmental impacts resulting from multiple sources of pollution. Site-specific compliance monitoring is usually narrowly focused on a given geographical area, pollutant source and a few selected contaminants. Only a regional long-term monitoring scheme can detect the gradual build-up of contaminants resulting from many local, small-scale contaminant events, each of which may be inconsequential by itself; and

3. To assure that the existing regulatory framework for marine environmental quality management is providing effective protection for the marine environment and its living resources; and to guide the adjustment of the regulatory framework when such protection proves inadequate.

Monitoring programs also involve close interactions with the design and implementation of research programs. They provide empirical field data to support and guide controlled laboratory tests. Such tests are indispensable because they are sufficiently rigorous to establish the effects of pollution. However, laboratory tests alone are insufficient because they often cannot simulate the natural environment very well. Carefully designed monitoring programs help to make this essential "lab-to-field" link. They also provide guidance to marine environmental-quality research programs, assisting them in targeting resources in the most important regions of the country and on the most important problems.

I will turn now to NOAA's major operational marine environmental-quality monitoring program, known as the Northeast Monitoring Program, or NEMP.

NOAA is committed to determine the effects of human activities on marine environments and resources. In response to the urgency of developing a long-term monitoring program, the Northeast Monitoring Porgram was established as a five-year pilot program in 1980 for the northeast region of the United States. NOAA's National Marine Fisheries Service and National Ocean Service jointly fund and manage this effort. The Northeast Monitoring Program addresses NOAA's marine pollution monitoring mandates, including broad-scale, resource-oriented data required under the Fishery Conservation and Management Act (P.L. 94-265), and intensive site-specific dumpsite data required under Section 201 of the Marine Protection, Research, and Sanctuaries Act (P.L. 92-532), as well as the general requirement under P.L. 92-532 to monitor and assess the health of important marine ecosystems.

NEMP has been operating for three years. Annual reports for 1980 and 1981 were published, and the 1982 report has been drafted. In these reports, the general health of the marine environment is treated, with specific descriptions of contaminants in seabed sediments, particulate-borne contaminants in the the water column, and biotic effects of these contaminants. Areas of degradation or potential concern are identified and monitored closely. There is a serious attempt in all these studies to distinguish between natural variability and anthropogenic changes in the marine environment. The most effective way to make this distinction has been to maintain a consistent sampling program over a number of years. When a sampling series is disrupted for any reason, not only are data no longer collected, but there is the potential that past data will not be interpretable and hence rendered useless. A recommendation can be made for the consistent provision and application of resources in monitoring programs such as NEMP, as well as those programs described below.

Another NOAA monitoring effort, conducted by the National Marine Fisheries Service, is the Microconstituents Program. This program is intended to detect threats to human health which may result from ingestion of seafood contaminated with toxic chemicals and pathogenic microorganisms. Results are used to define health standards for the seafood industry and to assure consumer protection. This information is available to Federal and state public health authorities, the seafood industry and fishery managers.

The approaches taken by this program include research on the accumulation and metabolism of toxic chemicals in marine animals. The Microconstituents Program is still relatively new, but preliminary surveys have already measured metals and pathogens in an estuary in South Carolina and another in Mississippi; petroleum contaminants in fish inhabiting a large area stretching from the mouth of the Chesapeake Bay to the Mexican border in the Gulf of Mexico, and PCBs and pesticides in fish from the Florida Keys. Continuation of these surveys would establish important trends in the quality of marine resources around the coast -- resources which could be eventually consumed by humans.

Lastly, I wish to describe briefly NOAA's current development of a national marine environmental quality status and trends program. This program is being designed to provide a uniform monitoring and assessment capability whereby marine and estuarine environments around the Nation can be compared on a standardized basis. The program's concern will be focused on potential threats to human health and to the health and survival of commercially significant or protected living resources. Where applicable the program will use data from existing measurement programs, will be organized into operational and data analysis phases, and will be responsible for quantifying toxicant and pathogen concentrations, as well as measuring important ecological effects.

An effective quality assurance program is a prerequisite for the success of the monitoring programs I have described. I am pleased to report that Administrator Byrne has recently established a Quality Assurance Program to be conducted jointly by four of the line offices of NOAA. This program will ensure that measurements of toxic chemicals and pathogenic microorganisms made throughout NOAA and by NOAA contractors are of a known quality and are adequate for their intended use. Once we have our own program in place and can evaluate its performance, we plan to explore the benefits of expanding this program to include other Federal agencies.

Mr. Chairman, this concludes my prepared remarks. I would be glad to respond to the Committee's questions.

Mr. **SCHEUER**. Very good.

Mr. Alan Hill, Chairman of the Council on Environmental Quality, is our next witness.

STATEMENT OF A. ALAN HILL, CHAIRMAN, COUNCIL ON ENVIRONMENTAL QUALITY

Mr. **HILL**. Thank you, Mr. Chairman.

My name is A. Alan Hill; I am Chairman of the Council on Environmental Quality.

Mr. Chairman, members, I will keep my formal remarks very brief.

I would like to briefly focus on two of the major issues which were raised in the CEQ report, Interagency Task Force on Environmental Data and Monitoring. I refer specifically to the issue of assuring the quality of environmental data and the question of coordination of environmental monitoring and data activities.

I am pleased to note that significant progress is being made in the area of quality assurance. For example, at about the time the task force report was being completed, EPA undertook a major initiative to improve the quality of the environmental data which the agency was collecting. That program remains in effect today, and I understand from Dr. Courtney Riordon that real progress is being seen, particularly in respect to the quality of air monitoring data.

Perhaps the most difficult problem addressed by the interagency task force was the issue of coordination among the various agencies that develop, process, and use environmental monitoring data. The problem of coordination continues to be an issue of major concern, although I believe that we are beginning to make significant progress in this area.

The interagency task force itself served as a spur to the various agencies to improve both internal and multiagency coordination. A primary example of this was the development of aquatic life survey which is just now being completed by the EPA and the Department of Interior's Fish and Wildlife Service.

The role of CEQ in this process of coordination is that of a catalyst. CEQ does not itself carry out monitoring programs. Rather, it collects, integrates, and interprets environmental data gathered by many different agencies. CEQ will continue its role as a catalyst in environment monitoring.

In this regard, there are several specific projects that I would like to briefly mention today. These projects are, first, the interagency toxic substance data committee's chemical substances information network program; second, the data monitoring programs of the Interagency Task Force on Acid Precipitation; and, finally, a CEQ-sponsored study by the World Wildlife Fund.

On the Chemical Substances Information Network, or, as we call it, CSIN, the Toxic Substances Control Act recognizes the data and information requirements for rational and cost-effective decisionmaking. In its directives to CEQ and to EPA, TOSCA recognized the importance of improving interagency coordination in the generation, sharing, and management of information about chemical substance life cycles and effects upon the environment.

In order to reduce the information regulatory burden required by TOSCA and related laws, the Interagency Committee focused on the development, implementation, and testing on the Chemical Substances Information Network.

CSIN is not a database itself and, thus, does not duplicate the data contents or processing capabilities of any information resource. Rather, it aids in data location and retrieval. In layman's terms, CSIN is a computer system that supports users in the access and use of an array of public and privately managed chemical information systems. CSIN allows the user to obtain information by communicating with the computer network containing over 400 databases. This saves the user from having a manual for use in each individual information system. CSIN provides a mechanism for identifying and delivering to its user in a cost-effective and timely manner the many scientific research and chemical data resources available from diverse parts of Government and the private sector.

From one computer terminal, the user can use different databases and analytical approaches for data evaluation and comparison. As an additional payoff, it has important characteristics that aid the development of responsible environmental programs. Aside from providing one manual for access in over 400 separate databases and analytical packages, CSIN is a mechanism that offers improvements in managing the vast amounts of information that are often necessary to make responsible decisions by our agency.

On the Acid Precipitation Task Force, in January 1983, CEQ was designated the Executive Secretary of the Task Force by the White House. We still continue our participation as a member of the task force.

The task force operates through a number of task groups composed of various member agencies. The task force monitoring efforts are undertaken by EPA, Agriculture, NOAA, Energy, and the Department of the Interior. The fiscal year 1984 budget for monitoring is approximately $6 million out of a total commitment of some $27 million for task force programs.

The deposition monitoring task group has a number of objectives. The first objective is to determine the spatial and temporal variations in the composition of atmospheric deposition within the United States through the national trends network. Their second objective is to develop methods for measuring dry deposition of acidic materials. The third objective is to continue to increase efforts that support research methods of deposition monitoring. The final objective of the task group is to support a global trends network through operating monitoring sites at remote locations that are part of an existing worldwide monitoring program.

On our study being done by the World Wildlife Fund, for sometime CEQ has chaired the Cabinet Council Interagency Global Issues Working Group. The objective of this group is to examine the data needs of the Federal Government for the global environment. CEQ has recently commissioned a study to be conducted by the World Wildlife Fund USA. This study will inventory and examine currently available data systems in the private sector that relate to population size and growth, timber supply and demand, food production, water use and supply, energy supply and demand, mineral resources, and pollutant discharges. This project will be an important contribution to our understanding of the data and data systems that are currently available for the global environment.

Mr. Chairman, I would be happy to answer any questions.

[The prepared statement of A. Alan Hill follows:]

STATEMENT OF A. ALAN HILL
CHAIRMAN
COUNCIL ON ENVIRONMENTAL QUALITY
BEFORE THE SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE
RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES

MAY 26, 1983

Good afternoon. My name is A. Alan Hill. I am the Chairman of the Council on Environmental Quality (CEQ). As you know, CEQ was established by the National Environmental Policy Act (NEPA) to advise the President on environmental issues. Because of the Council's long-standing interest in the area, it is a pleasure to meet with you today to discuss the very important subject of environmental monitoring.

Mr. Chairman, I will keep my formal remarks very brief. I understand that the Subcommittee already has copies of the 1980 CEQ Report, Interagency Task Force on Environmental Data and Monitoring. I also understand that earlier witnesses, in particular, Dr. Reisa, has provided you with many of the findings and historical background which led to and were involved in the activities of the Interagency Task Force. Therefore, I do not propose to go through the report in detail here. Rather, I would like to briefly focus on two of the major issues which were raised by the report. These issues are: assuring the quality of environmental data, and the coordination of environmental monitoring and data activities.

The federal government has been grappling with the problem of how to improve its environmental data gathering and forecasting capabilities to predict and solve emerging problems for some time.

As early as 1908, President Theodore Roosevelt attempted to institutionalize a body for the inventory and preservation of natural resources. Various administrations since have experimented with a number of mechanisms to collect and use reliable data. As indicated in the Task Force Report, these attempts have often suffered from deficiencies of timeliness, economy, sophistication, or, in some cases, the education of intended users of specific monitoring programs.

However, before casting stones at past and current practices, I think that it is necessary to be sure that we understand just what it is that we are talking about. As with most environmental issues, the subject of environmental monitoring is a complex one. There are many kinds of monitoring which are carried out for what are often quite different purposes. The types of monitoring information needed for determining compliance with a particular regulatory program are quite different from those which are necessary to determine long-term trends or to identify emerging problems.

I think that this point was made quite well by Dr. Philip Cohen of the U.S. Geological Survey (USGS) when he testified before your Subcommittee last week. In his discussion of the USGS National Hydrologic Benchmark Network and the National Stream Quality Accounting Network (NASQAN), he raised and responded to a number of criticisms which had been leveled at those programs by the Government Accounting Office (GAO) and others. The GAO was quite correct in suggesting that fixed-station networks such as the NASQAN program are not particularly useful for determining local water quality in stream reaches where an acute water pollution problem may exist. The GAO recommended that the NASQAN program be abandoned in favor of placing more emphasis on intensive surveys within particular stream reaches. However, such intensive surveys, while effective for looking at site-specific pollution problems, are not very useful for determining national long-term trends. I believe that the bottom line is that we need to continue to collect both kinds of information.

This brings me to the issue of environmental data quality assurance. Regardless of the type of environmental monitoring data to be generated for whatever purpose, it is useless to expend resources for such data at any level of government without incorporating the means of assuring the quality of that data for its intended purpose. In this area of quality assurance, the Task Force found critical deficiencies in station-siting criteria, field methodology, sample preservation in the storage and processing time before analysis and data distribution. The Task Force made recommendations regarding the developing of standardized methods, for the collection, analysis, storage, shipping, reporting, and in the field measurements used in gathering data. In addition, certification criteria and performance checks for laboratories should be developed. Also, the Task Force saw the need for minimum requirements to assure that measurements conformed to broadly accepted standards of measurement. Finally, quality assurance programs were seen as most effective if they were independent of the management of the monitoring programs, and the Task Force recognized the need for all environmental data to be accompanied by estimates of accuracy.

In summary, the Task Force recommended that each federal agency with an environmental data and monitoring program should initiate a quality assurance program. Quality assurance was seen as a substantive management consideration in the design and funding of these programs. The Task Force recommended that data standards and definitions be published by each agency. In addition, the Task Force recognized that all interagency environmental activities should explicitly deal with quality assurance. For example, it is most obvious that agencies that store data from outside their own agency should identify the quality of those data before storing them. The Task Force also felt that it is important to ensure that quality assurance receives priority in the budget process of the various agencies.

As the Chairman of the Council on Environmental Quality, I fully support these recommendations on data quality assurance. I am pleased to note that significant progress is being made in this area. For example, at about the time that the Task Force Report was being completed, the EPA undertook a major initiative to improve the quality of the environmental data which the agency was collecting. That program remains in effect today, and I understand from Dr. Courtney Riordan that real progress is being seen, particularly in respect to the quality of air monitoring data.

Perhaps the most difficult problem addressed by the Interagency Task Force was the issue of coordination among the various agencies that develop, process and use environmental monitoring data. The interagency working groups found that there were many cases of fragmented data collection efforts. Many data sources were found to be designed and developed unilaterally with insufficient knowledge or concern for potential users outside of specific program needs. The Task Force also found that significant improvements might be obtained by taking into consideration the needs of potential uses prior to the collection, processing, and distribution of data. They also saw the need for greater utilization of available federal, state, and private facilities, capabilities, and resources to collect data in the most efficient and effective manner. The lack of communication among data users was seen to cause the development of new systems which often overlapped existing systems.

The problem of coordination continues to be an issue of major concern, although I believe that we are beginning to make significant progress in this area.

The Interagency Task Force, itself, served as a spur to the various agencies to improve both internal and multi-agency coordination. A prime example of this was the development of the Aquatic Life Survey which is just now being completed by the Environmental Protection Agency and the Deparment of the Interior's Fish and Wildlife Service. That particular study is not only an example of improved coordination among different agencies with shared environmental information needs, it also begins to address some of the other issues raised by the Task Force report such as initial statistical design of monitoring surveys. It also provides the beginning of a response to recommendations by the GAO that EPA should place more emphasis on the collection of biological data rather than an over reliance on chemical and physical data.

The role of CEQ in this process of coordination is that of a catalyst. CEQ does not, itself, carry out monitoring programs. Rather, it collects, integrates and interprets environmental data gathered by many different agencies. As Chairman of CEQ, I can and do bring agencies together to find out what is going on in any number of program areas. I also make recommendations about what the agencies should be doing to bring about improvements in their programs. However, I think that the process of actual data collection is more properly the role of the line agencies in charge of specific environmental quality management programs.

CEQ will to continue its role as a catalyst in environmental monitoring. In this regard, there are several specific projects that I would like to briefly mention today. On the first of these projects I am a joint chairman with EPA officials. For the second, CEQ has recently been appointed as the Executive Secretary. The third project is being conducted under a contractor to CEQ. These projects are:

1. Interagency Toxic Substances Data Committee (ITSDC) Chemical Substances Information Network (CSIN) Program
2. The Data Monitoring Programs of the Interagency Task Force on Acid Precipitation
3. CEQ-sponsored study by the World Wildlife Fund

Chemical Substances Information Network

The Toxic Substances Control Act (TSCA) recognizes the data and information requirements for rational and cost-effective decisionmaking. In its directives to CEQ under Section 25(b) and to EPA in Section 10(b), the TSCA recognized the importance of improving interagency coordination in the generation, sharing, and management of information about chemical substance life cycles and effects upon the environment.

The ITSDC recognized the need to develop some mechanism for organizing the various data and information resources in the private and public sectors. A coherent and cost-effective means was needed to manage the access, collection, and analysis of the data relating to toxicological, biological chemical, and physical properties of the substances used and found in our environment.

The ITSDC further recognized that over 200 uncoordinated federal systems had information relevant to chemical substances. Because the primary purpose of such systems is to support the missions of the different agencies, the systems were geographically dispersed and often contained duplicative information. Moreover, many of the systems could not interface because some equipment, computer command languages, record formats were incompatible. The use of highly specialized data and analytical techniques also limited information exchange potential.

In order to reduce the information and regulatory burden required by TSCA and related laws, the ITSDC focused on the development, implementation and testing of a "Chemical Substances Information Network" (CSIN) project.

CSIN is not a data base itself and thus does not duplicate the data contents or processing capabilities of any information resource but rather aids in data location and retrieval.

While CSIN is not yet available to the general public, a pilot program has been underway. As of this date, 74 private and public sector organizations have been trained to use CSIN and are currenting testing the prototypic version.

In layman's terms, CSIN is a computer system that supports users in the access and use of an array of public and privately managed chemical information systems. CSIN allows the user to obtain information by communicating with a computer network containing over 400 data bases. This saves the user from having a manual for use in each individual information system.

CSIN provides a mechanism for identifying and delivering to its user in a cost-effective and timely manner the many scientific research and chemical data resources available from diverse parts of government and private enterprise. It insures completeness of research efforts while offering cost reductions by avoiding duplication of efforts. CSIN also reduces the cost of performing analyses with new data in the existing analytical frameworks developed by different agencies. Thus, CSIN provides both the access to new data and the capability of using it in analytical frameworks necessary for decisionmaking. For example, it is possible to combine and compare the data resources. From one computer terminal, the user can use different data bases and analytical approaches for data evaluation and comparison.

As an additional payoff, it has important characteristics that aid the development of responsible environmental programs. Aside from providing one manual for accessing over 400 separate data bases and analytical packages, CSIN is a mechanism that offers improvements in managing the vast amounts of information that are often necessary to make responsible decisions by our agencies.

Monitoring Studies Undertaken by the Task Force on Acid Precipitation

In January 1983, CEQ was designated the Executive Secretary of the Task Force by the White House, while continuing its participation as a member of the Task Force. The Interagency Task Force on Acid Precipitation was established by the Acid Precipitation Act of 1980 (P.L. 96-294) to plan and manage the National Acid Precipitation Assessment Program. Planning for the National Program began in October 1980, when the Task Force was first organized. In accordance with the Act, the Task Force developed a draft National Acid Precipitation Assessment Plan, outlining the proposed research effort. That plan underwent extensive public review and was submitted to Congress in June 1982.

The Task Force operates through a number of task groups composed of various member agencies. The Task Force monitoring efforts are undertaken by EPA, USDA, NOAA, DOE, and DOI. The FY 1984 budget for monitoring is approximately $6 million out of a total commitment of some $27 million for Task Force programs.

The Deposition Monitoring Task Group has a number of objectives. The first objective is to determine the spatial and temporal variations in the composition of atmospheric deposition within the United States through a National Trends Network. Their second objective is to develop methods for measuring dry deposition of acidic materials. The third objective is to continue and increase efforts that support research on methods of deposition monitoring. The final objective of the Task Group is to support a Global Trends Network through operating monitoring sites at remote locations that are part of an existing worldwide monitoring program.

World Wildlife Fund Study for CEQ

For some time, CEQ has chaired the Cabinet Council Interagency Global Issues Working Group. The objective of this group is to examine the data needs of the federal government for the global environment. CEQ has recently commissioned a study to be conducted by the World Wildlife Fund. This study will inventory and examine currently available data systems in the public and private sector that relate to population size and growth, timber supply and demand, food production, water use and water supply, energy supply and demand, mineral resources, and pollutant discharges. This project will be an important contribution to our understanding of the data and data systems that are currently available for the global environment. I think that it will also be useful in assessing the future data and monitoring needs for your Committe and for the Executive Office.

In conclusion, I feel that, while progress is being made, there is still a great deal that must be done to improve our data-gathering efforts. Without accurate, timely, comparable, and reliable data, the line agencies charged with the development and implementation of programs to meet our environmental responsibilities cannot effectively determine the concentrations of specific chemical substances in our air and water, assess whether past environmental policies have been effective, and provide sufficient scientific data for use in future policy decisions. Monitoring is most properly the role of the line agencies in charge of program operations. CEQ has played an important role as a catalyst and will continue to play an important role in bringing agencies together to find out what they are doing and how coordination between the public and private sectors might be improved.

Mr. SCHEUER. Thank you very much.

I yield to my distinguished minority colleague, Congresswoman Claudine Schneider of Rhode Island.

Mrs. SCHNEIDER. Dr. Farrington, one short question: What is the status of the mussel watch program today?

Dr. FARRINGTON. Congresswoman Schneider, the mussel watch program was funded primarily by the U.S. Environmental Protection Agency—and I say primarily because some of the work was done in the laboratories where other funding was used as well to collect some of the ancillary data. This program is scheduled, as I understand it, to be phased out. At least I have been given my marching orders to conclude our part of the study which has been going on for the past years; to wrap it up, and to present a final report.

There is an overview document preparation proposal that is somewhere within the Federal agency right at the moment, within EPA, supposedly undergoing management review for funding.

Mrs. SCHNEIDER. You mentioned that you have been requested to do a final report, but yet in the testimony of all of the panelists here it seems that the word itself "monitoring" means a continuation of review or analysis. To say that this is the end of this monitoring program after a 2-year period doesn't seem to me is going to provide us with much information at all. One would question the value of having invested in it at all if we are not going to keep it going.

What is your opinion? Do you feel that it is valuable enough to keep on? I know I have to ask you to be nonparochial about the response to this question, but do you think that it is really a valuable program that should be continued?

Dr. FARRINGTON. Yes, I think it is a very valuable program. I think, for example, it is very assuring for us to be able to tell the people of the United States, as I indicated in my written testimony, that the dataset thus far shows no evidence of systematic or regional elevation of plutonium as a result of the use of plutonium in the nuclear fuel cycle. In that respect, I think that the program has provided some valuable data.

What is not commonly recognized is that the program was a research program to indicate a prototype. The idea in 1978 and 1979 was that we would have technology transfer of that prototype to an operational program. For reasons, as I indicated in my testimony, that I do not know and can only speculate on, that transfer did not take place.

Mrs. SCHNEIDER. By saying technology transfer, are you suggesting that mussels may not be the medium that will be used in the future and it will be replaced by technology, computers?

Dr. FARRINGTON. No. What I mean by that, Congresswoman, is that——

Mrs. SCHNEIDER. Robots, whatever?

Dr. FARRINGTON. What I mean by that, Congresswoman, is that the technology and the tactics, if you will, of the strategy of sentinel organisms as exhibited in the mussel watch program—the transfer of that from the research phase into an operational monitoring program. The State of California has done that on a State basis, and I am sure that there are several local programs around the country where that is being done as well.

Mrs. SCHNEIDER. To your knowledge, have you or any other scientists involved in the mussel watch program made an effort to appeal to Mr. Ruckelshaus and put forward your case for the value of continuation of this monitoring program?

Dr. FARRINGTON. We have not had an opportunity at this time to put forward our case to Mr. Ruckelshaus. We have had several interactions over the past 3 years with the people in the Environmental Protection Agency.

I must be quite candid and say that those interactions, at least in Washington, at the higher levels have not been as productive as we had hoped. I think in part, though, this is due to some concerns that we really don't know yet what the national marine environmental quality policy is, and it would be a mistake to implement a monitoring program on a full scale—that is, move it out of research and into an operational phase—until we understand what the policy is and what that monitoring program is going to serve.

Mrs. SCHNEIDER. Let me shift this question now to Mr. Hill and Mr. Ehler.

Mr. SCHEUER. May I interrupt just to ask a question?

What do you think the policy should be?

Mrs. SCHNEIDER. That was my question, Mr. Chairman. We are on the same wavelength.

What is the policy?

Mr. SCHEUER. I think Dr. Farrington said in his testimony that there isn't any policy. Maybe what we ought to ask is, what ought the policy to be? He said it is a nonpolicy.

Mrs. SCHNEIDER. Yet, Dr. Ehler had suggested that NOAA is moving toward the development of a policy and a monitoring program.

Perhaps you could articulate for us exactly what the objectives of that policy are and who some of the players are.

Mr. SCHEUER. And do this in light of Dr. Farrington's statement that the reason that there isn't any policy is because there are unclear national policy objectives, we do not know how to implement the monitoring, and that there is funding disagreement between agencies on who is to provide the gilt.

Mrs. SCHNEIDER. I would just like to restate the question that the chairman was so articulate in presenting to you, I believe.

There have been other criticisms before this hearing that there is no national monitoring policy. There have been complaints that one agency is not aware of what the other agency is doing. There have been funding disagreements between agencies. What makes it even more difficult is that we may decide on funding levels here for NOAA and EPA, and some other committee will decide on funding levels for the same project for another agency—the Department of Agriculture or somebody else. Therefore, this is a constant theme we have been hearing for a couple of years now.

I am just wondering if Dr. Ehler and Mr. Hill could elaborate as to what the policy objectives are, when you expect them to be operational, and who are going to be the players in this whole game plan.

Dr. **Ehler**. You ask a very difficult question, but I will try to be direct in my response. I agree with Dr. Farrington that there is no national policy, if in fact we need a national policy on marine environmental quality monitoring. I will limit my comments to the marine environment. There are not pieces or components of such a program, such as mussel watch and other monitoring programs, that in fact could easily be combined and better coordinated to provide such a program.

In terms of policy goals, there are many different objectives for the use of the marine environment. If we are talking about pollution or environmental quality goals, then these are clearly stated, I think, in legislation such as the Clean Water Act and the Ocean Dumping Act. This legislation sets a framework for the kinds of monitoring that we should be providing in the Federal Government. NOAA's goal within that framework is to assess long-term trends in environmental quality.

EPA has the responsibility for compliance monitoring. Any specifics related to the Clean Water Act should be directed toward them.

Under our own statutory guidance, we carry out long-term environmental quality monitoring to a very limited extent, but certainly not at the comprehensive national level that we are striving for.

Mrs. **Schneider**. I was a little shook up when I started to read this background on environmental monitoring. It sort of should be titled, "Everything You've Always Wanted to Know but Were Afraid to Ask About Monitoring." I learned that some time ago, back in 1965, the President's Science Advisory Committee had suggested in "Restoring the Quality of our Environment," which was a document put forward—it made numerous recommendations for improving monitoring. Many of the recommendations have yet to be carried out. That was in 1965.

Then in 1972 Congress attempted to improve the Nation's information base on environmental quality by passing H.R. 56, which was the National Environmental Data System which Nixon vetoed because it did not seem to have a clear-cut direction. It did not make sense.

Then in 1977 a committee of the National Research Council concluded that the state of the environmental quality is deplorable and unnecessarily bad, and it goes on and on. I keep thinking if NOAA is involved with a long-term environmental quality monitoring, EPA is involved with compliance monitoring, and you have various data sources—local, State, regional, and national—is NOAA going to be the agency or could or should NOAA be the agency that would develop an entire national comprehensive monitoring plan, both for compliance and for general studying of the quality of the environment? Can we ever pull all of it together or should we?

Mr. **Hill**. Mrs. Schneider, could I cut in for a minute? You are running across some very important questions and some that I am very sympathetic to.

However, the executive branch is generally responsive to laws passed by the the Congress.

Mrs. **Schneider**. Do you want a law from us?

Mr. **Hill**. You have, in essence, a situation of more or less tunnel vision, as in looking at meeting a water quality requirement, for instance. A program is built around meeting those requirements.

Where we can build a coordinated approach, as with the Acid Precipitation Task Force that mandates agency participation in development of a coordinated program, then we can start feeding in from all the participating agencies.

It is very frustrating, as I have talked about. Take, for instance, the budget of the task force. Those funds are not culled out in a separate appropriation. They are appropriated to each of the line agencies. There are six of them that get appropriations, and you have probably had that frustration. Where is the $27 million? It is there.

The point is that there is a coordinating mechanism that is there in place that has mandated the coordination.

Mrs. **Schneider**. OK. I am told that I am going to have to fly in order to make this vote on the floor.

I thank the witnesses for their insight. Regrettably, we do have to adjourn, but we will be sending you some questions in writing. Hopefully, you will be able to enlighten us further.

Mrs. **Schneider**. Thank you very much.

[Whereupon, at 12:05 p.m., the subcommittee recessed, to reconvene at the call of the Chair.]

NATIONAL ENVIRONMENTAL MONITORING

THURSDAY, JUNE 2, 1983

House of Representatives,
Committee on Science and Technology,
Subcommittee on Natural Resources,
Agriculture Research and Environment,
Washington, D.C.

The subcommittee met, pursuant to call, at 2:35 p.m., in room 2325, Rayburn House Office Building, Hon. James H. Scheuer (chairman of the subcommittee) presiding.

Present: Representatives Scheuer and Tom Lewis of Florida.

Mr. Scheuer. We are expecting Congressman Rod Chandler of the State of Washington, who is a very hard-working and devoted member of this subcommittee, but he has been voting over there. I guess freshmen take longer to vote than senior members. I am known as the fastest gun in the West when it comes to voting.

Incidentally, we just finished a vote since we convened here. The Wirth amendment passed by quite a substantial margin. That provides about $30 million more for research and about $120 million more for EPA. So we ought to all have big Cheshire cat grins on our faces after this.

The Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

Today is the last of 3 days of hearings on the problem of national environmental monitoring and the hows and the wheres and the whats and the whens and the prospects for setting up a national environmental monitoring system.

We are holding these hearings because of our concern about the Nation's environmental monitoring programs, programs which are necessary, not only for enforcing existing environmental statutes but for detecting future environmental problems as well.

Our objectives are to identify problems and to make recommendations that will lead to improvements in environmental monitoring.

During the first 2 days of hearings we received testimony from Federal agencies, among others, which monitor air, surface water, ground water, and pollution in the marine environment.

We also heard from regional commissions and State agencies which monitor environmental quality. In addition, we heard from witnesses from the private sector who related problems in environmental monitoring and made some suggestions on how to improve our monitoring systems.

One of the suggestions called for the establishment of a commission to recommend to the Congress and to the President a plan for creating a national environmental monitoring program.

The recommendation is for a national program, not only a Federal program. It involves participation by and benefits for Federal, State, and local governments; regional commissions; industry; environmental, conservation, and health groups; and by scientific and academic experts.

The testimony received from the witnesses so far has helped to define what the tasks for the commission should be, and what elements should be included in a national environmental monitoring program.

Today we will hear from additional witnesses whose testimony will help us both to evaluate the recommendation of a commission as well as to improve the Nation's environmental monitoring.

It is through the contributions of today's witnesses, and those from the prior hearings, that we will determine what steps the Congress and the Nation will take to improve the Nation's environmental monitoring.

I think we will go ahead with the panel of witnesses, and when Congressman Chandler arrives we will ask him if he wishes to make a statement.

The witnesses are here as a panel. Mr. David Miller, president of Geraghty & Miller, Inc.; Dr. Richard Dowd, manager of the Policy Analysis Division of Environmental Research & Technology, Inc.; Mr. James Norris of the Chemical Manufacturers Association; and Dr. J. Clarence Davies, executive vice president of the Conservation Foundation.

We are delighted to have you all. What I will suggest is that each of you address the subcommittee for 7 or 8 minutes, hopefully speaking informally, and then we will have questions for the entire panel.

I might say that your prepared remarks will be printed in full, in their entirety, at this point in the record so there is no need for you to read slavishly from them. So if you will just chat with us informally, I think we will have the most productive way of spending our time.

We will start from your right and proceed to your left. We will save Dr. J. Clarence Davies, who is an old friend, for the dessert and start out with Mr. David Miller, president of Geraghty & Miller, Inc.

Mr. Miller.

STATEMENTS OF DAVID W. MILLER, PRESIDENT, GERAGHTY & MILLER, INC.; DR. RICHARD M. DOWD, MANAGER, POLICY ANALYSIS DIVISION, ENVIRONMENTAL RESEARCH & TECHNOLOGY, INC.; JAMES E. NORRIS, CHEMICAL MANUFACTURERS ASSOCIATION; AND DR. J. CLARENCE DAVIES, EXECUTIVE VICE PRESIDENT, THE CONSERVATION FOUNDATION

Mr. Miller. What I have done is to try to summarize my written statement and to just hit some of the high points, so I think I can do that in a few minutes.

As you know, I have been asked to comment on the ground water aspects of monitoring on a national basis, and that is the part of the environment that I am going to limit my remarks to, ground water. In the few minutes allotted, I would like to make a few points which I think it is important for the committee to consider.

The first involves the size of the ground water monitoring problem or the job of monitoring the ground water system. There is a tremendous effort already under way by private organizations, local, State, and Federal agencies in monitoring ground water, and developing an even greater data base on a national scale would be a vast undertaking.

Why would this be? Perhaps this can best be expressed by looking at and reviewing the three principal categories of ground water monitoring that are going on and what they involve.

The first category is quality assurance and what this involves is sampling wells that are being used for drinking water supplies to limit or eliminate health risks related to drinking ground water. The reason why this is a vast undertaking is the fact that, as you probably know, half of the people in the United States are drinking ground water.

This resource represents the water being used for drinking water purposes. The source of the supply comes from millions of private wells, wells in your own backyard, and literally thousands to tens of thousands of municipal or community wells. So to keep track of what is going on from these various sources of supplies is a very big job.

The second category of monitoring that is going on is monitoring long-term trends and water quality in aquifers due to existing or changing land use patterns.

Again, this is a very big job because most of the aquifers that are of any significance cover areas of hundreds to thousands of square miles and one or each well that is put in to monitor this system only measures an area less than the size of this room over a period of 5 to 10 years. That is because of the slow movement of the ground water and the very local nature of ground water quality.

Besides which, to get any real significant statistical information as far as an aquifer is concerned you need a lot of wells and a lot of water samples at thousands of dollars each. And there are many other priorities for public money.

The third category of monitoring that is going on is enforcement or source monitoring as indicated by recent regulations from RCRA, the Clean Water Act, et cetera. This, of course, is the monitoring that is going on to determine the impact of thousands of landfills, wastewater impoundments and unregulated sources such as leaky sewers, septic tanks, spills, et cetera.

To monitor any of these particular sources—and again, there are tens of thousands of these—you need more than one well to figure out what is really going on. You can't just put in one well and determine how ground water flows and what the water quality is, et cetera.

The second and related point I would like to stress is the site specific nature of ground water monitoring. Contamination of ground water from individual sources occurs in the ground as discrete bodies of degraded water, usually no larger in size than tens to hundreds of acres and moving very, very slowly.

In addition, there are few ground water contamination problems that could be considered of an interstate nature or even an intercounty nature and even rarely as intermunicipal. Thus, concern over both the impacts of land use and transient water quality exists on a very local level as indicated by the wide variety of approaches to ground water monitoring that we presently see across the Nation, and there is probably nothing less uniform than our approach on a national basis to protecting ground water.

Thus, a nationally oriented ground water monitoring program does not appear to be very helpful to the individual ground water user whether he is on Long Island or in Santa Fe, N. Mex., because it is what is going on next door that really counts as far as his supply is concerned.

So, in conclusion, I would like to see a continuing interest in ground water monitoring on the Federal level but directed toward support of research to provide more reliable monitoring activities and better data, rather than the development of a very complex and detailed data base on water quality information from a lot of different points.

Second, I would like to see funding of State and local monitoring programs directed toward protecting the ground water user. And finally, I would like to see the Federal Government continue pursuing special problems and studies such as those carried out by the U.S. Geological Survey.

Thank you very much.

[The prepared statement of Mr. Miller follows:]

Statement By: David W. Miller
Geraghty & Miller, Inc.
Consulting Ground-Water Geologists
Before U.S. House of Representatives
Subcommittee on Natural Resources,
Agriculture Research & Environment
June 2, 1983

My name is David W. Miller and I am a principal of Geraghty & Miller, Inc., Syosset, New York. I am a professional geologist with over 30 years experience in the ground-water field. My firm conducts studies and investigations throughout the United States and overseas relating to the development, management, and protection of ground-water resources. We provide hydrogeological consulting services to firms and organizations in the private sector and to all levels of government. I have been asked to provide some thoughts on the current state of environmental monitoring and how it can be improved. As my staff and I specialize in the management of ground-water resources, I must limit the following comments to ground-water monitoring.

It appears that everyone is monitoring some aspect of our ground-water resources -- private firms in businesses totally removed from ground water; private and public "firms" in the business of providing ground water; governmental agencies with a mission to protect our health; and governmental agencies with a mission to keep track of the resource and enforce the laws intended to protect it. Indeed, we are familiar with ground-water monitoring programs carried out by private firms, Federal agencies, State agencies, Special Districts, County agencies and Townships -- all of these programs are designed for different purposes and are operated and supported under vastly different mandates.

Ground-water monitoring is an expensive and labor-intensive undertaking. It may also have severe legal and financial implications. Given these rather negative benefits, it is reasonable to ask why there is so much ground-water monitoring activity. We can generally assume the following reasons:

- it is an administrative requirement with sanctions for non-compliance,
- it is included in a governmental agency's mission statement,
- it is needed to prosecute or defend litigation,
- it is needed as an input to many private and public sector decisions,
- it is needed to evaluate the progress and consequences of certain administrative requirements.

We should note that most of the decisions relating to the use and protection of our ground-water resources concern industrial facilities, well fields, individual wells and other relatively small areas. The need for small area and site-by-site information is stressed in CWA, RCRA and in State requirements. Indeed, as administrative law generally contemplates enforcement, it is necessary to organize ground-water monitoring efforts to facilitate enforcement. In effect, our regulations, which are often intended to establish minimal requirements, establish a reporting norm on a site-by-site basis. It is irrational to expect private sector owners and operators of facilities to bear the cost and uncertainty of ground-water monitoring except on a site-by-site basis. On the other side, those in the water-supply business must demonstrate that their product complies with applicable standards. The more enlightened suppliers have now implemented monitoring programs to track long-term trends in ground-water quality and quantity, but their interests are generally limited to wells, well fields and watershed/recharge areas.

Agencies that operate under a public health mandate are concerned with the need to organize and implement responses to health-related ground-water problems which are generally confined to relatively small areas. State and Federal agencies must, by necessity, concern themselves with site-specific data because it is most relevant for consent and compliance purposes.

In short, the decisions that must be made from ground-water monitoring data will tend to define the nature of the information that is collected and, in general, we must assume that current practices are sufficient for their intended purpose -- at least insofar as scale is concerned. As the scope of the data base seems relevant to the nature of the decisions that it must support, and these decisions are made every day, there may be no effective impetus to create a national ground-water monitoring system or data bank beyond STORET, WATSTORE and other current efforts.

Although we may differ from other participants by accepting the lack of a national ground-water monitoring system, we do believe that an organized effort is needed to assist all of us who must make real world decisions based on ground-water monitoring data. I think that we would all like to believe that these data bases represent actual conditions with a high degree of confidence. Unfortunately, this is not always the case and, at times, all of us must make critical decisions from very imperfect information. While I am not sure that we will all be able to make more confident decisions from a national ground-water monitoring program, I am reasonably certain that all of us would benefit from improved guidance regarding the statistical techniques needed to determine the size of the data base actually required to support various types of decisions, effective methods to screen the data and, ultimately, a useful working definition of confidence itself.

I would encourage and participate in any Federal effort which can help us make more confident decisions concerning the use and protection of our ground-water resources.

Thank you.

Mr. SCHEUER. Thank you very much, Mr. Miller.

Now, Mr. Richard Dowd.

Dr. DOWD. Mr. Chairman, thank you.

You asked me to address three questions with regard to environmental monitoring, toxic monitoring, recommendations for industry participation and improvements in enviromental monitoring. I would like to cover those in order, but before I do so, I would like to spend just a moment or two talking about the background of environmental monitoring.

I am most familiar with the program as carried out in EPA so I will confine my remarks to my observations of an involvement with the monitoring program at EPA.

It goes without saying that quality control and quality assurance are the sine qua non of a comprehensive and consistent monitoring effort whether it be on a factory or a scientific bench or in the environment. If one cannot know how good the data is one does not know how to rely on the data.

Therefore, the ways in which the quality of the data is assured are absolutely critical to the use and usefulness of any data. This obviously does not mean every piece of data must be perfect. Indeed, that is impossible.

It does mean that each piece of data gathered as part of a system must fit with the objectives of that system to be useful. It is quite conceivable that different monitoring systems could have substantially different levels of precision and accuracy, and still meet their essential needs.

In an agency like EPA, presently organized, there are both internal and external problems with regard to quality assurance. The internal problem is, whether or not the QA requirements, that each of the programs decides are necessary, meet generally accepted standards. Here I believe the EPA has a mixed record.

In some cases, quality assurance has been paid very little even lip service. In other cases, the quality assurance program has been formalized.

In any event, it is critical that a traffic cop be established and given enough resources to carry out its mission in assuring the quality of the data. I question whether those resources, in fact, have been given at the agency now.

The second question is an external one. Again, EPA has a mixed record. The air program has established a series of regulations and is increasingly beginning to implement them and require that State and local agencies meet those regulations on quality assurance for sites that are in their national air monitoring systems, the NAMS network.

Water monitoring is in a different position and there is little opportunity at this moment to influence the quality assurance carried out by State and local governments. At best there is a set of guidelines but there are no regulations that require them to be met.

Indeed, the monitoring system that EPA has established allows the State and local governments to put in virtually any information with any quality assurance that they wish. This raises major questions as to whether or not the information is of significant value.

The sum of this, in my view, is that although we can tell a few very gross features of the environmental contamination of a more or less conventional sort, nitrogen oxide, total suspended solids, et cetera, in fact the program does not provide the kind of information at present that would enable us to really see whether and how there is a trend in environmental levels and whether or not the ambient environment is getting clearer.

I would like to address the question of toxic monitoring as a very special issue. The general population is quite concerned about the potential presence of toxic chemicals in the air they breathe, water they drink, and land they use.

In many ways, the concern is based on very little information. Evaluation of existing data indicates that information or priority pollutant concentrations and surface water quality trends is not extensive. Several reasons exist for this situation.

The techniques used to detect and quantify the presence of priority pollutants and their ambient levels are on the threshold of analytical science. Little continuity is apparent and priority pollutant measurements are complex and costly.

There is little continuity for monitoring, especially for priority pollutants, and for surface waters the situation is particularly bleak. Consequently, piecing together the national situation from very different data sets requires considerable judgment and recognition of the limitations in assessment of water quality.

Any evaluation of water quality benefits will require a much better understanding of the presence of priority pollutants, their concentrations and the impact that measurement uncertainties have upon enforcement.

The national monitoring effort is critically needed to assess requirements for additional controls to evaluate benefits already obtained and to assist those who would use the information. Virtually every study which has attempted to investigate water quality levels nationally has found a lack of data.

Therefore, in my view, there is strong need to carry out a program of monitoring toxics in water, a need to identify where problems may exist, which chemicals are at high enough concentrations to be hazardous and whether benefits are likely to be obtained from cleanup.

The same kind of problem that is evident in water is also evident in air. For the list of potential organic hazardous air pollutants that EPA is evaluating, the Agency has very little information available on ambient concentrations. Even for those listed as hazardous, benzene, vinyl chloride, and arsenic, no consistent effort has been undertaken to determine where levels may be of considerable concern.

The Agency has gotten a start in the area of metals in the air through its inhalable particulate network which has taken measurements at 165 sites across the Nation. Although the network has been designed primarily as a research experiment to measure respirable particulate matter, in addition, a series of metals and other compounds can be analyzed using the same filters by X-ray fluorescence.

Since the agency owns and operates the stations, a good quality control progam has been established. While the network is not perfect and as a whole has only been operating for some 2 years, it has the potential of providing significant information on the presence and concentration of elemental metals.

Mr. Chairman, I have recently discovered that this monitoring network discussed is in the process of being shut down. At present there are only 70 of the 165 sites still operating. By the end of 1983, all of the sites except for 11 will be closed, and in 1984, the remainder will be eliminated.

Although this network was designed for research purposes, even the research on concentrations of toxics in the air needs much more than a single year or two. In any event, the EPA scientists in the Research Triangle Park were quite prepared to maintain its life for a considerable period of time.

In my view, to reduce this potentially valuable network for lack of resources would be a terrible waste. The phrase comes to mind, "For want of a nail the shoe was lost."

The present situation with respect to ground water has been just discussed by Mr. Miller and I won't go into that.

If you agree with my reasoning to date, I think you will agree that there is a substantial need for a large increase in monitoring, particularly in the area of toxics. We do not have a good inventory of the concentration of toxics in the ambient environment for even a better priority list of them in either air or water.

A substantial increase in resources seems to be in order. The budgetary process the last several years, however, gives me no confidence that the kinds of resources that are needed will be available to develop and implement a new monitoring system.

The Agency's budget for monitoring has not been substantially increasing. State grant funds have been reduced while their responsibilities have been increased. Therefore, it seems quite clear to me that the money available for monitoring is likely to decrease rather than increase and the pressure on the states will be to reduce their monitoring efforts.

There are other institutions than government who are interested in having more and better information. These include the industrial sector which believes that if the information were available, it would show that there is less of a problem with toxics than concern is indicated. This would include universities who have an interest in the proper research and analysis of information and this would include environmental organizations who believe that with better information, one could, in fact, target more specifically the problem spots.

I think the results of the strong need for monitoring data coupled with potentially large decreases in monitoring efforts by public agencies give us the opportunity for a rich and vital cooperative venture between government and other institutions, particularly industry.

I go over some of the details of one of my suggestions, Mr. Chairman. I will skip through some of that.

I do believe that if there were a framework in which other institution could contribute and take part in a measurement effort on the ambient environment, that one would find some increase in the level of monitoring activity. Obviously, a concomitant to this participation would be that some institution, I would suggest EPA, need to serve as a traffic cop for quality and to make sure that the quality of the data coming meets the standards that ought to be established.

There are many industrial facilities located on rivers in which they do have an interest in the quality of the water upstream in the plant. There are many industrial facilities that are interested in the quality of background levels of toxics in the air and many facilities that need to know the background levels of the aquifers adjacent to or near their plants.

Obviously, it is impossible to tell ahead of time where exactly one would have a response. But even if the Fortune 500 companies each carried out a single monitoring site in the water, for example, for toxics, one would have 500 sites, which is half the national network for conventional pollutants. I believe there is an opportunity where industrial and governmental cooperation could bring great benefits to both.

One of the key problems with the direction of environmental monitoring in my view is its dispersal among various program offices within EPA. This had led in my view to inadequate attention to the coordination of quality assurance principles and inefficient use of resources, the information gathered being rarely useful to organizations outside of the program office and to a directive which impedes comprehensive monitoring at the State and local level.

The argument is often made that the generators of the data must be in the same office as the users of the data. Thus, each program office has its own monitoring program. The fault with this prescription is that there is a tendency to keep the information solely within the program office. Therefore, it is not easily available openly.

The State and local agencies who gather most of the data are agents for other actions such as permit writing and enforcement. Therefore, critiques of monitoring take second place to efforts to improve the other activities and there is not a real opportunity for self-correction such as could occur with critical reviews by a client.

One of my recommendations, therefore, is that all the monitoring activities within EPA be housed within a single program organization which disburses monitoring funds and gathers the data for all measurements such as air, water, and land. There is no guarantee such a structure would be perfect, but in my view it would be better than the present uncoordinated one and could hardly be worse.

In summary, I believe there should be a commitment to initiate a national monitoring program for toxics, a place for nongovernmental institutions, particularly industry, to participate in such a monitoring program and a single office within EPA which plans and implements the EPA portions of both the toxics program and, if possible, conventional monitoring as well.

Thank you, Mr. Chairman.

Mr. SCHEUER. Thank you very, very much.

[The prepared statement of Dr. Dowd follows:]

Testimony of

Richard M. Dowd, Ph.D.

My name is Richard M. Dowd. I am currently Manager of the Policy Analysis Division of Environmental Research and Technology, Inc. I served as the Acting Assistant Administrator for Research at the Environmental Protection Agency from November 1980 through June 1981. In addition, I was the Executive Director of the Science Advisory Board and the Science Policy Advisor to the Administrator from 1977 through 1981. I have previously acted as the Chief Scientist for Energy, Environment and Natural Resources in the Congressional Budget Office and as Assistant Commissioner for Policy Planning and Research in the Connecticut Department of Environmental Protection. In addition, I spent five years as Assistant Professor of Physics at Tufts University. My testimony reflects my professional judgement.

INTRODUCTION

Mr. Chairman, you have asked me to address three questions related to environmental monitoring; toxic monitoring; recommendations for industry participation; and improvements in environmental monitoring. I would like to address each of those questions in turn; however, I would like to start with a background review from my standpoint on general problems with environmental monitoring. I would then like to address toxics as a special and important issue. Then, industry and other institutional participation in environmental monitoring, and finally, some ways in which I think that the direction of monitoring could be improved.

I am most familiar with the environmental monitoring program carried out by EPA. So, I will confine my remarks to my observations of and involvement in the monitoring program at EPA. It goes without saying that quality control and quality assurance are the sine qua non of a good, comprehensive and consistent monitoring effort whether it be in a factory, on a scientific bench, or in the environment. If one cannot know how good the data is, one does not know how to rely upon that data; therefore, the ways in which the quality of the data is assured are absolutely critical to the ultimate use and usefulness of any monitoring data in my view. This assuredly does not mean that every piece of data must be perfect. Indeed, that is impossible. It does mean that each piece of data gathered as part of a system must fit with the objectives of the system to be useful. It is quite conceiveable that different monitoring systems could have substantially different levels of precision and accuracy and still meet their essential needs.

In an Agency like EPA, as it is presently organized with respect to its internal structure and with respect to the agents that carry out the monitoring, there are two problems with regard to QA: one external and one internal. The internal problem revolves around the question of whether or not the QA requirements, that each of the programs decide are necessary, meet generally accepted standards to assure the kind of quality this program must have. Here, I believe that EPA has a mixed record. In some cases, quality assurance has been paid very little even lip service, and in other cases, the Quality Assurance Program has been formalized in a way which might lead to good conditions and that might lead to the assessment of good quality. In any event, it is critical that a traffic cop be established internally which, in fact, has been done and that the traffic cop be given enough resources to carry out its mission. I question whether that has been done. Resources are necessary in order that reference standards are prepared that laboratories can be evaluated, and that faults can be corrected.

The second issue is an external one. If the general criteria that are needed to assure the quality of the data are established, the Agency must then require that the generators of the data, in most cases local and state agencies which collect environmental monitoring data, meet those conditions. Again, EPA has a mixed record. The air program has established a series of regulations and is increasingly beginning to implement them and require that state and local agencies meet those regulations at least for the sites that are in their National Air

Monitoring System (NAMS). This would potentially have some clout since NAMS is funded by EPA and in order to enter such data into the National Data System, these requirements must be met. Water monitoring is in a very different position and there is very little opportunity at this moment to influence the quality control carried out by the state and local governments which make the ambient measurements for the Agency. At best, there are a set of guidelines, but there are no regulations that require them to be met. Indeed, the monitoring data system that EPA has established allows the state and local governments to put in virtually any information with any quality they wish. This raises major questions as to whether or not the information is of value.

The pesticide program, that monitoring of it which remains, does test for presence of pesticides in human tissue, but much of the program which carried out residue measurements on urban, rural, and agricultural soil has been eliminated. As a result, we really do not know what is happenning in terms of pesticide contamination in our soils.

The sum of this, in my view, is that although we can tell a few very gross features of the environmental contamination of a more or less conventional sort (nitrogen oxide, total suspended solids, etc.), in fact, the program does not provide the kind of information at present that would enable us to really see whether and how there is a trend in environmental levels and thus whether or not the ambient environment is getting cleaner. Obviously, this is less true in air pollution monitoring which has more data of a higher quality than in water where it is very questionable whether a given piece of data available at the national level has quality control that is sufficient to be of any use at all.

TOXICS MONITORING

I would like to address the question of toxics monitoring as a very special issue. The general population is quite concerned about the potential presence of toxic chemicals in the air they breathe, the water they drink, and the land they use. In many ways, the concern is based on very little information.

Evaluation of existing data indicates that information on priority pollutant concentrations and surface water quality trends is not extensive. Several reasons exist for this situation: (a) the techniques used to detect and quantify the presence of priority pollutants at their ambient levels are on the threshold of analytical science, (b) for many pollutants little continuity of monitoring is apparent and (c) priority pollutant measurement is complex and costly.

In the case of priority pollutants, the concentrations observed in water are generally on the order of one to tens of parts per billion. Since the measurement techniques are at their detection limits for these low concentrations, the uncertainty in results can be great. While some of the variation is due to fluctuations in actual concentrations, a great deal of the variation is a result of different techniques used by laboratories — with variations easily as much as 50%. In addition, the samples are not a pure chemical, but a real world mixture of a number of chemicals which can interfere with each other masking or enhancing the final quantification.

Secondly, there is little continuity of monitoring especially for priority pollutants. For surface waters, the situation is particularly bleak as the primary source of such data is state monitoring efforts which rarely include analyses beyond conventional pollutants, a few metals and some pesticides. Consequently, piecing together the national situation from very different data sets requires considerable judgement and recognition of the limitations in assessment of water quality.

Any evaluation of water quality benefits will require a much better understanding of the presence of priority pollutants, their concentrations and the impact that measurement uncertainties have upon rational enforcement of discharge limits. A national monitoring effort is critically needed to assess requirements for additional controls , to evaluate benefits already obtained and to assist those who would use the information.

Virtually every study which has attempted to investigate water quality levels nationally has found a lack of data. Even EPA's own study investigating 34 hot spots reluctantly came to the conclusion that the majority of those could not be identified solely from water quality measurements but rather from the concentration of industrial and municipal effluent discharges to surface waters. In my view, knowing the concentrations of effluent discharges is insufficient. Such concentrations of effluents may or may not produce high levels of toxic pollutants in the nation's water.

Therefore, in my view, there is a strong need to carry out a program of monitoring toxics in water. A need to identify where problems may exist, which chemicals are at high enough concentrations to be hazardous, and where benefits are likely to be obtained from clean-up.

The same kind of problem that is evident in water is also evident in air. A good example has been the inability of the Agency to compare in any realistic way, the air levels found at areas of considerable concern such as Love Canal with any large data base for the nation as a whole. It is very hard to determine whether Love Canal ambient measurements of volatile organics are better or worse than other places in the Country. For the list of potential organic, hazardous air pollutants that EPA is evaluating, the Agency has very little information available on ambient concentrations. Even for those that have already been listed as hazardous such as benzene, vinyl chloride and arsenic, no comprehensive, consistent effort has been undertaken to determine where levels may be of considerable concern.

The Agency has gotten a start in the area of metals in the air through its inhalable particulate network which has taken measurements at 165 sites across the nation. Although the network has been designed primarily as a research experiment to measure respirable particulate matter, in addition, a series of metals and other compounds can be analyzed using the same filters by xray florescence. Since the Agency owns and operates the stations, a good quality control program has been established. While the network isn't perfect and as a whole has only been operating for some two years, it has the potential of providing significant information on the presence and concentration of elemental metals. That is not the case for the organics for which there is still virtually no information except here and there on a small suite of chemicals which includes solvents such as benzene and toluene and a few cases where one has done actual human exposure.

Mr. Chairman, I have recently discovered that this monitoring network discussed is in the process of being shut-down. At present, there are only 70 of the 165 sites still operating. By the end of 1983, all of the sites, except for 11, will be closed, and in 1984, the remainder will be eliminated. Although this network was designed for research purposes, even the research on concentrations of toxics in the air needs much more than a single year or two, and in any event, the EPA scientists at Research Triangle Park were quite prepared to maintain its life for a considerable period of time. In my view, to reduce this potentially valuable network for lack of resources would be a terrible waste. The phrase comes to mind "for want of a nail, this shoe was lost..."

The present situation, with respect to ground water, is essentially the same as in air and water. That is to say, there is very little data. As a result of clean-ups of superfund sites and RCRA permits, there certainly will be monitoring established at abandoned sites and some of the new permitted landfill sites; however, that is really a fairly limited set of aquifers that will be tested, and there has been no attempt to review the quality of groundwater in the United States. Even on a statistical bases, a system needs to be addressed which would allow one to decide whether or not a monitoring system would be useful; this has not been done.

INDUSTRY PARTICIPATION

Mr. Chairman, If you agree with my reasoning to date, I think you will agree that there is a substantial need for a large increase in monitoring, particularly, in the area of toxics. We do not have a good inventory of the concentration of toxics in the ambient environment nor even a better priority list of them in either air or water yet. A substantial increase in resources seems to be in order. The budgetary process the last several years, however, gives no confidence that the kinds of resources that are needed will be available to develop and implement a new monitoring system. The Agency's budget for monitoring has not been substantially increasing. State grant funds have been reduced, while their responsibilities have been increased; therefore, it seems quite clear to me that the money available for monitoring is likely to decrease rather than increase, and the pressure on the states will be to reduce their monitoring efforts rather than increase them. The cost between carrying out a network to measure conventional pollutants is less than that for the toxics for the same number of sites; therefore, a modest reduction in the number of sites for conventional pollutants would likely not provide a substantial increase that could be used for toxics. This seems to put us between Scylla and Chrybdis. We clearly have a need for monitoring, we clearly have less resources, and the question is what can we do to resolve the situation.

There are other institutions than government who are interested in having more and better information. These include the industrial sector which believes that if the information were available, it would show that there is less problem with toxics than concern has indicated. This would include universities who have an interest in the proper research and analysis of information, and this would include environmental organizations who believe that with better information, one could in fact target, more specifically, the problem spots. I think the results of the strong need for monitoring data coupled with potentially large decreases in monitoring efforts by public agencies give us the opportunity for a rich and vital cooperative venture between government and other institutions, particularly industry.

Most major industrial plants and municipal treatment plant owners have an interest in monitoring the ambient condition of the water and air that they use. Indeed, many industries currently measure substantial quantities of the list of 129 priority pollutants. I believe that right now is an opportune time for a government/industrial cooperative planning effort involving several important issues. The first of these would, of course, would be to define the role of the various institutions.

While each individual company might not want to have very many monitoring stations, a handful or even one for each major industrial concern and selected municipal treatment plants would provide a very substantial level of monitoring. In combination with the existing network this would or could provide very broad and comprehensive program. Obviously, issues that need to be addressed include:

- What should be monitored? In water, should it be sediments, water column, or biota?
- Should one look at the health of biological systems?
- Should one only measure for biological uptake?

In addition, what pollutants should be measured for? Clearly, the list of 129 or the total list of potential hazardous air pollutants may not be the proper list. There may be a smaller list of 35 or 40 that ought to be addressed often on a fairly routine basis. There may be another handful that ought to be measured everywhere at all times. There may be another group that should be measured only on a site-by-site basis. However, if one could establish roles for the different institutions involved in monitoring, and answer questions such as including who does the monitoring? How is it to be done? Who reviews the quality of the measurements? How is data to be stored? Who gets to retrieve it and which chemicals ought to be measured everywhere, which ones ought to be only site specific? One would have accomplished a great deal.

There are many ways to deal with these issues. It is clear that I have a specific model in mind. That model is not the only one. It is my strong feeling that absent any near-term effort we will loose the opportunity to make a major contribution to the knowledge of water and air quality. If we do not undertake a serious review and development of monitoring programs, when the Clean Water Act and Clean Air Act are up for renewal in five years, we will find ourselves in exactly the same situation as today. (Too many assumptions about which pollutants are problematic and too little information to respond effectively.) Without more information, there is no chance to develop an approach which pairs specific problems with specific solutions.

I believe that if there were a framework in which other institutions, particularly industries but also including universities and any other groups, could contribute and take part in a measurement effort on the ambient environment, that one would find some increase in the level of monitoring activity. It certainly would be a mistake to allow industrial facilities to be the only ones carrying out a good and proper monitoring program. In my view, however, it would be a mistake not to allow them to participate. Obviously, a concomitant to their participation would be that some institution, I would suggest EPA, need to serve as a traffic cop and to make sure the quality of the data coming meets the standards that ought to be established. I think there are many industrial facilities located on rivers in which they do have an interest in the quality of the water upstream of the plant. I think that there are many industry facilities that are interested in the quality of the background levels of toxics in the air, and I think there are many facilities that are interested in the background levels of the aquifers adjacent to or near their plant.

Obviously, it is impossible to tell ahead of time where exactly one would have a response, but even if the Fortune 500 companies each carried out a single monitoring site in water for example for toxics, one would have 500 sites which is half of the national network for conventional pollutants in water. I believe this is an opportunity where industrial and governmental cooperation would bring great benefits to both.

OVERALL DIRECTION WITHIN EPA

One of the key problems with the direction of environmental monitoring, in my view, is its dispersal among various program offices. This has led to inadequate attention to the coordination of Q.A. principles, an inefficient use of resources, the information gathered being rarely useful to organizations outside of the program office, and to a directive which impedes comprehensive monitoring at the state and local level.

During the time that I was heading the Monitoring Committee in 1979-1980, we estimated somewhere in the range of 50 to 100 million dollars was being spent by the Agency, mostly through states and monitoring activities. The return for that investment is ludicrously small.

The arguement is often made that the generators of the data must be in the same office as the users of the data. Thus, each program office has its own monitoring program.

The fault with that prescription is that:

- there is a tendency to keep the information solely within the program office; therefore, it is not easily avaialble openly;

- the state and local agencies who gather most of the data are agents for other actions such as permit writing and enforcement; therefore, critiques of monitoring take second place to efforts to imporve the other activities; and

- there is not a real opportunity for self-correction such as could occur with critical views by a client. (Everyone learns to live within this system rather than changing it.)

One of my recommendations is that all monitoring activities within EPA be housed within a single organization, which disburses monitoring funds and gathers the data for all measurements such as air, water, and land. There is no guarantee that such a structure would be perfect, but in my view, it would be better than the present uncoordinated one and could not be worse.

In summary, I believe that there should be:

- a commitment to initiate a national monitoring program for toxics;

- a place for non-governmental institutions, particularly industry, to participate in such a monitoring program; and

- a single office within EPA which plans and implements the EPA portions of both a toxics program and if possible, conventional monitoring as well.

Mr. SCHEUER. Now we will go on to Mr. Jim Norris of the Chemical Manufacturers Association.

We are particularly interested in hearing from you. I don't want to get into the business of asking questions now, but we are interested in involving industry in a national environmental monitoring system—in fact, ultimately in a global environmental monitoring system.

We would like to do it in ways that are cost effective and convenient and not oppressive and not burdensome and not generally a pain in the neck, but that are easy and convenient and acceptable.

We would like to have your thinking and it does not have to be in your direct testimony. We will have many chances to ask you some questions.

But we feel, my personal conviction is that we have not tapped industry's talents well enough and there is a hell of a lot of expertise out there. We have not tapped it. And that is a failure of our government system.

I don't say that occasionally there may not be lapses on the part of industry, but that also points the finger of blame at Members of Congress and also the administration.

You have one of the most lugubrious examples of that if you have read the New York Times this morning. There is an article about the Dow Chemical Co. going off and having a little investigation themselves of the discharges of dioxin that they are pouring in on a daily basis into the Tittabawassee River that empties into Lake Huron.

This was a press conference that was held in Midland, Mich., at their plant, and the purpose of the research is to assuage the public and lessen concerns. They have already made this an exercise in press relations, this research. And they hope to involve the Federal and State governments and the University of Michigan.

Just as a matter of curiosity, our office called the Chicago office of EPA and we were told by them that the first that they had heard about this was when they read the New York Times today. Dow Chemical Co. thought so little of the Federal involvement and of the merits of collaborating with the EPA that they had not informed them. They had not drawn them in.

They had not involved them in working out this research design. They had not even told them of the press conference as a matter of minimum courtesy, so that the first that the EPA heard about it was from the New York Times this morning, which was when we heard about it.

Now I don't say that in any harsh, critical way. I say that identifying a failure of the system.

I suppose that Dow has as brilliant a collection of scientists in the field of toxic chemicals as exists anywhere on Earth, and to me it is a national tragedy that we have not involved them long since in identifying long-term threats long before they became real.

We should have known years and years and years ago. They identified 20 years ago that dioxin was of concern to them, yet they kept it a secret. They did not talk to the government.

They called other chemical companies together and gave them the preliminary results of their investigations and apparently asked for a pledge of secrecy from all of them involved. To date, they still refuse to permit EPA scientists into their plant to examine the dioxin polluted wastes that they are pouring into the Tittabawassee River.

Again, I am not blaming Dow, although I say more in sorrow than in anger that they don't represent the quality of corporate moral responsibility and the quality of corporate statesmenship that I learned about at the Harvard Business School four decades ago.

I was educated to expect more from our corporate giants. They may be giants in their balance sheets and income statements, but they don't exhibit giantism when it comes to responsibility and moral leadership. That is a failure of our society, and I take full blame here in Congress that we have not created the proper structural and environmental mechanism.

When I say environment in this sense I am talking about the Government environment, that we have not created the kind of environment that would make it easy and acceptable and convenient and almost natural for them to involve themselves in a cooperative effort to solve these problems with Government.

We are not adversaries in wanting our chemical industry not to degrade the environment and our national health. These people all have wives and kids and grandchildren. They are all just as good Americans as we are. And how we happened to get into this revolting confrontational posture that we are in now is beyond my imagination, and I deeply regret it.

I feel a terrible sense of guilt that Congress has permitted it to happen and that we have not long since created an environmental monitoring system that involved industry and involved all of that brilliant professional talent in positive constructive ways to identify problems decades before they would become serious.

I am perfectly willing to say along with Harry Truman that "the buck stops here." We have failed and we have failed to illicit from industry the statesmanship and the leadership and the sense of corporate moral and ethical responsibility that I know is there.

Why we engendered this feeling of hostility and secrecy and this conspiratorial attitude of confrontation that the Federal Government is the enemy and EPA is the enemy, I find it just impossible to understand, and I think I am a pretty sophisticated guy. But all understanding of this phenomenon escapes me and I wish that you could help us understand this and help us find a way out of this.

And if you feel that you want to bring some of your respective corporate executives in to talk to us either at a hearing or at a private informal session, we know the talent is there. We know the caring and sense of involvement and mutual concern for health and our national environment is there, but so far, Congress has failed in liberating it.

I had not intended to make a speech. Now, at this point I have got to yield to my very distinguished colleague from the minority side, a very active, very involved, very participating member of this subcommittee, Tom Lewis of Florida.

Mr. LEWIS. Thank you, Mr. Chairman.

Mr. SCHEUER. We are sort of breaking this thing up. Since I was the guilty one, I have to invite you to join me.

Your time has expired, Mr. Norris. Fear not.

Mr. LEWIS. Mr. Chairman, I listened with great interest to what you had to say and I certainly have to agree with most all of your comments.

I am anxious to hear what Mr. Norris has to say.

Mr. SCHEUER. You are?

Mr. LEWIS. Yes, sir, what he has to say in respect to your comments and also his presentation.

Mr. SCHEUER. OK, Mr. Norris. The field is yours. We are looking forward to hearing from you.

Mr. NORRIS. Thank you, Mr. Chairman.

Mr. SCHEUER. May I say that your organization has, in a sense, epitomized the problem by suing the EPA along with the Environmental Defense Fund to force them to do the research that they should have done in order to regulate toxic chemicals and our environment in general in ways that were cost effective, in ways that were sensible and in ways that were nonobstructive and nonburdensome to industry, and with the underlying principle that in order to do this, EPA has to fire not with a 12-gage shotgun but with a high-powered rifle and an 8-power scope.

EPA has to do its homework before they can regulate on a basis that is sensible. Before they can regulate on a basis that does not necessarily cripple industry and put unnecessary financial burdens on industry that, to a man or to a woman, this Congress wants to avoid.

But yet, ironically enough, in a conservative Republican administration, this administration is denying EPA the tools to accrue the knowledge that would enable them to set reasonable limits on environmental degradation with which industry could comply sensibly on a basis that it was cost beneficial.

That is something else that I don't understand. But let me say that your CMA has performed a great public benefit, I think, in bringing this lawsuit and symbolizing to the public as well as to the courts the urgent need both of industry and to the devoted environmental groups themselves, the utter need, the total need for EPA to have the knowledge that they desperately need to regulate intelligently.

I want to thank you for having brought that lawsuit and I hope very much that good things will come from it.

Please proceed.

Mr. NORRIS. Thank you, Mr. Chairman.

The comments that you just made really speak to the essence of the few comments I will make in my written testimony, because fundamentally industry as well as the environmental groups as well as the Environmental Protection Agency all have an interest in good science.

The old Latin expression is magnus veritas est, great is truth, so if we know what the problems are and can define them properly and we can assemble a proper problem-solving mechanism, we will succeed; but if we are all scattering in many different directions, then we do have problems.

I will hit a few of the highlights here in my written testimony and then be quite willing to answer any of the questions that you may have.

The Clean Water Act as well as the Clean Air Act, RCRA, and Safe Drinking Water Act all contain provisions which insist upon proper point source facility monitoring. And speaking to your point about industry's development in the technological areas of monitoring, technology that has been developed during the last decade has truly increased our ability to identify and to monitor environmental constituents.

Our industry in particular has contributed substantially to this development and we believe that the state of the art point source monitoring where we can routinely determine measurements in the high parts per billion level is quite well established.

The picture is not so clear when dealing with ambient and environmental effects monitoring as opposed to individual facility monitoring. The data interpretation and the technical requirements of such monitoring also are somewhat obfuscated.

There are many studies that have identified the inadequacy of ambient air monitoring, and these are referenced in my testimony.

In many cases, however, the inadequacy lies not so much with the ambient monitoring network but with the quality of the data which is generated, and much of the data is not verified, and procedures that exist to insure adequate quality control are indeed few. Guidance for interpreting the data obtained is also lacking. Finally, the uncertainty of those areas is what we believe EPA should be addressing more comprehensively.

Existing guidance developed by EPA on sampling, analytical methodology, quality control and data interpretation is inadequate. Our member companies are concerned with this and we encourage the Congress and the EPA to take the following actions: To provide for additional funding through EPA's Office of Research and Development for, first, developing, testing, and validating sampling and analytical methods for facility and ambient monitoring programs.

Second, to investigate anticipatory monitoring concepts designed to identify contamination problems before they occur, a point to which you referred.

Evaluating environmental effects monitoring and transferring on an as-needed basis environmental monitoring technology to State regulatory personnel is of little benefit if EPA has one analytical sampling methodology and a State that has, for example, NPDES issuing authority is doing something quite different.

In addition, we believe it is necessary to develop an overall environmental monitoring policy through EPA's office of policy and resource management with the assistance of other Federal agencies that would clearly delineate responsibilities for the various aspects of monitoring. That policy should then be reviewed by the full science advisory board.

Let's next address surface water quality and ground water monitoring issues. Let me speak primarily at this juncture to the monitoring of priority pollutants.

In the proposed effluent guidelines for organic chemicals, plastics, and synthetics, EPA has published a value of 10 parts per billion to be used to determine frequency of monitoring for a given priority pollutant. EPA has also proposed a maximum concentration level of 50 parts per billion for many chemicals.

Now, this proposal implies that the methodology called GC/mass spec—gas chromatography mass spectroscopy—is capable of detecting and quantifying priority pollutants at this level and with some degree of certainty. Results from EPA's interlaboratory round robin study plus additional information from the EPA/CMA five-plant study, simply do not support these conclusions.

We are rather speaking here, Mr. Chairman, to the difficulties of trying to measure, for example, the width of a hair using a very high quality yardstick. There is no difficulty in measuring the width of this pencil with a yardstick, but if you have a tiny filament of a hair, using that tool may not be quite adequate.

Now, if the hair is so fine as to almost seem to disappear to eyes such as mine, then if you can't be sure what is there, then how can you measure it?

Continuing. Under groundwater monitoring I have several comments. Almost all activities of establishing a groundwater monitoring program from the construction and installation of wells to final acquisition of samples using some sort of sampling device are fraught with uncertainties, sources of errors, and sources of well and sample contamination.

Currently, the state of the art in groundwater sampling and data interpretation is in a complete state of disarray. EPA has not developed standard practices, equipment or protocols for groundwater sampling and monitoring for trace levels of organics.

A great deal of money has been spent to identify precautions in groundwater monitoring, but little resources are devoted to establishing an actual monitoring program in identifying health and environmental effects.

Turning to solid waste monitoring issues, environmental monitoring requirements for RCRA have focused on waste characterization and compliance determinations.

The methodology used in these areas has been borrowed from water programs often with very little regard to whether or not it could be used with complex waste matrices.

Let's take the analogy of the hair again. If one has a nice, dark, fine hair against a white background, one perhaps can hope to see it and perhaps, with the right tools, to measure its presence. If, on the contrary, you place it against a bed of wool and other fibers, then seeing that one hair may be extremely difficult. So this is the matrix effect that I refer to here.

Speaking further with regard to waste characterization, those components of EPA's listing procedure under RCRA are technically questionable. In many cases, methodology contained in SW-846 "Test Methods for Evaluating Solid Waste," which incidentally is the required book of methods for characterizing hazardous wastes, provides little detailed information, lacks basic analytical approaches, and contains no information on data management.

With regard to the appendix VIII compounds, interim final regulations for permitting of land disposal regulations require groundwater monitoring for all 379 appendix VIII constituents. These conditions under which they are to be monitored occur when a statistically significant increase occurs in a parameter or constituent listed in the permit. CMA has concerns with these requirements specifically and the analytical methodology, SW-846, used for this monitoring.

The basic problem is that SW-846 cannot be used for groundwater analysis because it lacks the completeness and organization of a standard user's manual. The CMA environmental monitoring task group, of which I am chairman, reviewed the first version of SW-846. We admire EPA's enthusiasm in attempting to get on the streets a manual that could be used.

The technical coherence, the excellence of the manual were both very, very questionable, and I am quite charitable in that regard. We encourage EPA to modify SW-846 in future version's so that it can be useful to the regulated community.

This completes my formal remarks. I would be glad to answer your questions.

[The prepared statement of Mr. Norris follows:]

STATEMENT

OF

JAMES E. NORRIS

SUPERVISOR, ANALYTICAL AND QUALITY CONTROL

CIBA-GEIGY CORPORATION

ON BEHALF OF THE

CHEMICAL MANUFACTURERS ASSOCIATION

My name is James E. Norris. I am Supervisor for Analytical and Quality Control for CIBA-GEIGY Corporation. Today I am testifying on behalf of the Chemical Manufacturers Association (CMA) on the subject of environmental monitoring. CMA is a nonprofit trade association whose company members represent more than [illegible] of the productive capacity of basic industrial chemicals within this country. CMA members are directly and significantly affected by the environmental monitoring requirements associated with the regulatory programs implemented from environmental legislation passed over the last decade, and thus we are vitally interested in the current review of environmental monitoring by this Subcommittee.

The Clean Water Act (CWA), Clean Air Act (CAA), Resource Conservation and Recovery Act (RCRA) and Safe Drinking Water Act (SDWA) contain provisions which emphasize point source facility monitoring. Regulations proposed and promulgated under these statutes have fostered the development of an environmental monitoring network designed primarily to aid in determining facility compliance. We believe that these regulations provide a sound basis for detecting and measuring pollutants which may be harmful to the public.

Technology developed during the last decade has greatly increased our ability to identify and to monitor environmental constituents. Our industry has contributed substantially in the development of this technology, and we believe that the state-of-the-art of point source monitoring, where we now routinely determine concentrations at the high parts per billion level, is well established. We support the Environmental Protection Agency's (EPA) intent to delegate management of point source monitoring to the states. This function is consistent with the current management authority many states have with the existing NPDES/ or Clean Water Act permit program.

The picture is not as clear when dealing with ambient and environmental effects monitoring (as opposed to individual facility monitoring), data interpretation, and the technical requirements of environmental monitoring. Various studies have identified the inadequacy of ambient monitoring networks.[1,2,3] We concur with many of the results from these studies, and we encourage EPA to continue efforts to improve existing ambient monitoring networks for assessing air and water quality.

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[1] "Comptroller General's Report to the Congress of the United States: Problems in Air Quality Monitoring System Affect Data Reliability," Government Accounting Office, September 11, 1982, #CED-82-101.

[2] "Report by the Comptroller General to the Congress of the United States: Better Monitoring Techniques are Needed to Assess the Quality of Rivers & Streams," Volume I, Government Accounting Office, April 30, 1981, #CED-81-30.

[3] The State of the Environment, The Conservation Foundation, (Report), 1982.

In many cases, however, the inadequacy lies not with the ambient monitoring network, but with the quality of the data generated. Much of the data is not verified, and few procedures exist to ensure adequate quality control. Guidance for interpreting the data obtained is also lacking. The uncertainty of these areas is what we believe EPA should be addressing more comprehensively.

Existing guidance developed by EPA on sampling, analytical methodology, quality control, and data interpretation is inadequate: the Section 304(h) Clean Water Act methods have never been finalized; SW-846, guidelines for solid waste analysis cannot be understood by the typical analytical chemist; and methodologies for sampling and analyzing groundwater have not been published in draft form, even though this is an extremely critical prerequisite for the RCRA and Superfund programs. Because our member companies are concerned with the effect these actions have on our industry, we encourage the Congress and EPA to take the following actions:

- Provide additional funding through EPA's Office of Research and Development (ORD) for: 1) developing, testing and validating sampling and analytical methods for facility and ambient monitoring programs; 2) investigating "anticipatory" monitoring concepts designed to identify contamination problems before they occur; 3) evaluating environmental effects (multimedia, whole systems) monitoring; and 4) transferring on an as-needed basis environmental monitoring technology to state regulatory personnel.

- Develop an overall environmental monitoring policy through EPA's Office of Policy and Resource Management (OPRM), with the assistance of other federal agencies, that would clearly delineate responsibilities for the various aspects of monitoring; the policy should then be reviewed by the full Science Advisory Board.

Implementation of these actions will strengthen our existing environmental monitoring network. If these actions are implemented the establishment of a national environmental monitoring board, as suggested by this subcommittee, would not be necessary. Specific areas of concern to CMA, which are discussed in more detail in this statement, can be adequately addressed through EPA's research and program office responsibilities.

I. Surface Water Quality and Groundwater Monitoring Issues

The ambient water quality monitoring and data storage systems, STORET (Storage and Retrieval System) and NASQAN (National Stream Quality Accounting Network) have been discussed by GAO.[2] CMA agrees with the conclusions of this study. In this regard, the monitoring stations in many instances are not located at points that are representative of local water quality conditions. We do, however, believe that the ambient water quality networks can be useful if upgraded and states have the necessary funding for support. STORET data can also be useful if properly screened -- much of the existing information is of poor quality and not useful for assessing water quality trends.

CMA's three specific concerns in this area are as follows:

A. Monitoring of Priority Pollutants

In the proposed effluent guidelines for organic chemicals, plastics and synthetics, EPA has published a value of 10 ppb to be used to determine frequency of monitoring for a given priority pollutant. EPA has also proposed a maximum concentration level of 50 ppb for many chemicals. This proposal implies that GC/MS methodology is capable both of detecting and quantifying priority pollutants at this level with some degree of certainty. Results from interlaboratory studies, including the EPA/CMA Five-Plant Study, do not support these conclusions.[4] A second study conducted by Shell Development Company[5] revealed that when a pollutant was present in a sample at a nominal 10 ppb level, only five of eight laboratories were able to detect its presence, and only one laboratory was able to provide a concentration value.

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[4] "CMA/EPA Five Plant Study," Prepared for CMA by Engineering Science, Inc., Austin, TX, April 1982.

[5] "Round-Robin of EPA Methods 624 & 1624 for Volatile Organic Pollutants," George H. Stanko, Shell Development Company, Presented at EPA's 6th Annual Seminar for Analytical Methods for Priority Pollutants, March 16-17, 1983, Norfolk, VA.

Moreover, the analytical methodology used to determine compliance or noncompliance with the law is not capable of distinguishing between concentration levels of 50 and 51 ppb of a pollutant. This situation creates a considerable problem with respect to enforcement and the analytical community. The fact is, neither an enforcement official nor an analytical chemist can be sure if observations of 45 ppb or 55 ppb represent compliance or noncompliance of the current state-of-the-art methodology.[6] It is necessary that EPA and the states provide "rational judgment" which will take into account variability questions for effluents and water quality.

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[6] To illustrate the best precision that can be achieved, assume an effluent discharge contains precisely 50 ppb (true value) of a volatile priority pollutant. What value would be obtained if this sample was analyzed for compliance monitoring? (Table 2) of a recent publication showed the average variability factor (Vu) observed for 15 compounds, studied eight laboratories, was 1.35 (upper 95 percent confidence limit). This was attributed to GC/MS method (624) variability alone. The calculated Vu for the sample where the true value is 50 ppb results in a range of expected values from 34 ppb (1/1.48 x 50) to 74 ppb (1.48 x 50). These calculations show the range of values that would be expected if one considers that the method variability alone for a sample containing 50 ppb (not a violation) is from 34 to 74 ppb. Only one percent of the values would fall outside this range. Obviously, there will be numerous analytical values above 50 ppb which indicate noncompliance.

B. Groundwater Monitoring

Almost all activities of establishing a groundwater monitoring program, from the construction and installation of wells to final acquisition of samples using some type of sampling device, are fraught with uncertainties, sources of error, and sources of well and sample contamination. Currently, the state-of-the-art in groundwater sampling and data interpretation is in disarray. EPA has not developed standard practices, equipment, or protocols for groundwater sampling and monitoring for trace levels of organics. A great deal of money has been spent to identify precautions in groundwater monitoring, but little resources are devoted to establishing an actual monitoring program on identifying health and environmental effects.

Because of the confusion in groundwater monitoring, EPA's Ground Water Supply Survey for Volatile Organic Contaminants (VOCs) is extremely suspect. The 1,000 well survey included an analysis of 34 VOCs in the parts per trillion range.[7] Contamination of local groundwater was claimed based on these data even though the variability of the analytical methods greatly exceeds the concentrations determined at these low levels. As a result, we still have no real idea of extent of contamination in the groundwater of this country.

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[7] Westrick, James J., J. Wayne Mello and Robert F. Thomas, (Technical Support Division, Office of Drinking Water, EPA, Cincinnati, OH), "The Ground Water Supply Survey: Summary of VOC Occurrence Data," June 1982.

C. Biomonitoring Use as a Monitoring Tool

Our primary concerns with using biomonitoring as a monitoring tool are the interpretation and application of the data, and the fact that biomonitoring cannot predict ecological effects. Additional concerns for the use of static-acute biomonitoring as a monitoring tool are the limitations associated with the methodology. First, it is not a precise measurement. It is also a poor procedure with respect to volatiles and metals. Second, it does not identify specific pollutants or the causes for a toxicity problem. Biomonitoring is only capable of suggesting a problem exists, and usually after the fact. If costs for biomonitoring are considered, the static-acute tests are relatively inexpensive. However, costs and skill-level requirements for flow-through systems are much higher and may be difficult to justify from the benefits derived.

We are begining to see biomonitoring requirements placed in some NPDES permits in EPA Regions III and IV. So far, these requirements are designed for data collection and do not contain enforcement provisions. It is our experience that the state-of-the-art of biomonitoring is not sufficient for use as a permit compliance and enforcement tool. We encourage EPA to develop a biomonitoring policy consistent with the state-of-the-art so any requirements developed are applied uniformly throughout the EPA regions and states.

II. Solid Waste Monitoring Issues

Environmental monitoring requirements for the Resource Conservation and Recovery Act have focused on waste characterization and compliance determinations. The methodology used in these areas has been borrowed from the water programs, often with little regard to whether it can be used with complex waste matrices. As the OTA has recently found: "considerable R&D has been directed toward developing analytical techniques for water quality analysis. Before these techniques can be used for hazardous waste surveillance or assessment efforts, however, they must be modified to suit the specific conditions and materials of concern in hazardous waste management."[8]

The contaminating problems associated with hazardous waste disposal are also more local, hence there is no need for a national monitoring network. We encourage EPA to use the available national resources for developing techniques specific to the hazardous waste area and to research environmental effects monitoring specific to the various disposal technologies. Questions posed by the public on the uncertainty of hazardous waste disposal could be more readily answered if we had more confidence in the regulatory monitoring procedures.

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[8] "Technology and Management Strategies for Hazardous Waste Control," Office of Technology Assessment, the Hazardous Waste Control Assessment Project Staff, March 1982.

A. Solid Waste Listing and Characterization Methods

The foundation for determining whether a waste is hazardous besides being reactive, corrosive, or flammable is based on toxicity is through a listing mechanism or the Extraction Procedure (EP). The EP, a shake extraction procedure, is designed to simulate leaching action within a landfill. Statistical studies of the EP conducted by the American Society for Testing and Materials and other groups have shown the EP results to vary widely under carefully controlled test conditions and to be extremely pH dependent.

The waste characterization components of EPA's "listing" procedure under RCRA are technically questionable. In many cases, methodology contained in SW-846 "Test Methods for Evaluating Solid Waste," (the required methods for characterizing hazardous wastes), provides little detailed information, lacks basic analytical approaches, and contains no information on data management. For example, information is not provided for "thirty-one . . . chemical groups of up to several thousand individual compounds -- far too numerous to analyze yet for which no 'indicator' compounds have been selected. No methods are given for 33 'exotic' compounds whose analyses require unique and very complex procedures. Methods do not exist for analyzing the 25 compounds that are unstable in water."[9] If EPA requires specific methodology to be used, then the methodology must be technically sound and properly peer reviewed before being promulgated.

B. Monitoring of Appendix VIII Compounds

Interim final regulations for permitting of land disposal facilities require groundwater monitoring for all 397 Appendix VIII constituents under certain conditions. These conditions occur when a statistically significant increase occurs in a parameter or constituent listed in the permit. CMA has concerns with these requirements specifically the analytical methodology (SW-846) used for this monitoring and the statistical test used to determine compliance. Since several parties are litigating the second concern, we will address only the first concern in this testimony.

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[9] Evaluation of EPA SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Mehtods for Appendix VIII Parameters," Report prepared for CMA by Environmental Testing and Certification Corporation, May 6, 1983.

SW-846 cannot be used for groundwater analysis because it lacks the completeness and organization of a standard user's methods manual:[9]

- A competent technician or chemist will not learn from the document how to perform a complete series of sampling and analytical tasks (simple changes such as the addition of a properly designed analytical scheme would greatly enhance the usability of SW-846);

- The quality assurance sections lack the important performance acceptance criteria for each parameter (hence, where multiple methods are offered, the analyst cannot make an appropriate choice), those sections also lack guidance on proper handling;

- The analytical methods cited have been taken from earlier EPA methods intended to serve different needs, there is no supporting documentation in SW-846 to show that EPA has demonstrated the validity of such methods for use in monitoring groundwater or leachate;

- The availability of certified reference standards for calibration and method validation was not discussed. Without reference standards one cannot validate the analytical methods properly or produce precise and accurate data; and

- The sampling sections are designed for solid wastes and are inappropriate for groundwater or leachate.

We encourage EPA to modify SW-846 so it can be useful to the regulated community.

C. Monitoring of Hazardous Waste Incinerators

Conditions of an incinerator permit require the monitoring of Principal Organic Hazardous Constituents (POHC). Few methods are available for the monitoring of POHCs, and most applicants submitting trial burn applications have had to develop their own monitoring methods. Another serious problem arises in the waste analysis for POHCs. Again, SW-846 is the required methodology. In addition to the problems identified under Item I(B) of this statement, the document also lacks the necessary detail to prepare a waste analysis. Determining the concentration of a specific POHC is impossible using this methodology.

EPA requires on-line monitoring for carbon monoxide (CO), In some cases the extremely hot temperature of the incinerator has damaged the instruments. If the CO monitor is connected to a real-time operating system, spikes (sporadic POHC concentrations) can trigger the operating sensor and shut down the incinerator. This interruption in normal operations is costly in terms of time and resources and can be dangerous in limited situations.

III. Air Monitoring Issues

To comply with the requirement of the Clean Air Act, our industry performs both facility and ambient air quality monitoring. Once again, reliability of the data is a key issue. Ambient air monitoring is used in establishing ambient air quality standards and issuing PSD permits. Facility monitoring is also used in the PSD permit process and the development of NSPS (New Source Performance Standards).

A. Ambient Air Quality Monitoring

GAO recently described problems with the ambient air quality monitoring network.[1] CMA concurs with these findings, and we note that the competency of the SLAMS (State and Local Air Monitoring Stations) and NAMS (National Air Monitoring Stations) networks varies with the ability of the locality to maintain the monitoring stations. This normally is in direct relationship to the availability of funding.

Much of the ambient air data has not been properly validated and should be considered suspect. Air quality trends are difficult to identify considering the lack of validation. Background data established for

PSD permitting is questionable for many states. We urge EPA to continue upgrading the ambient air quality monitoring systems and to provide additional technical assistance so reliable data are obtained.

Another need for appropriate monitoring methodologies lies with volatile oxygen hydrocarbon emissions. This is especially important for the development of NESHAPs where the extent of control is usually tied to ambient exposure. Additional research is needed on appropriate sampling equipment and analytical techniques, and we encourage EPA-ORD to undertake this research.

B. Facility Monitoring

CMA believes that EPA should be responsible for developing national monitoring standards, but the maintenance of facility monitoring programs should be delegated to the states. Appropriate maintenance and reporting guidance must be developed by EPA and provided by the states.

One area of concern lies with the reliability of instrumentation. Additional quality control testing of facility monitors is needed. Many times manufacturers' claims of the reliability of on-line instruments are not accurate and cannot be supported. A specific example is the optical equipment needed for opacity measurements. This equipment quickly malfunctions when exposed to high temperatures.

C. Air Quality Monitoring and Modeling

The uncertainty of ambient air quality monitoring is multiplied when used in conjunction with air quality models. The current approach of using the highest second-highest modeling value for NAAQS violation or PSD increment consumption provides no flexibility for uncertainty due to monitoring variability. An approach such as the one suggested by the American Meteorological Society would be more appropriate.[10] This approach would reformulate NAAQS violations or PSD increments to the 95th percentile thereby ensuring more accurate prediction of frequently occurring air quality and reducing the quantity of monitoring data required as input.

[10] AMS Report on Air Quality Models

Mr. SCHEUER. Thank you very, very much Mr. Norris.

Now we will hear our last witness before the questioning, Dr. J. Clarence Davies, executive vice president of the Conservation Foundation, who has been a witness before this committee on prior occasions and has always been a superb witness.

We are delighted to have you back again, Dr. Davies. Please proceed.

Dr. DAVIES. Thank you, sir.

Let me dispense with the discussions of either the needs or the problems with monitoring because I think they have been amply and well documented in the previous 2 days of hearings before this committee and also by the witnesses here today.

Let me go directly to the recommendations part of my discussion. However, I do want to say that I think that this committee is to be congratulated for focusing on the subject of monitoring.

As I say in my testimony, I think one of the major underlying problems with monitoring is that it is a political orphan. Nobody pays that much attention to it and perhaps the most important single step that can be taken to improve the monitoring system is the creation of a market for the data that comes out of that system. If Congress in particular demands that kind of data, expects it from the agencies, then I think you will see fairly rapid progress in creating the data.

I do think we need to be careful, though, in having too high expectations for any kinds of changes in the system, at least in the short term. We are dealing with lots of different agencies, lots of different kinds of monitoring and lots of problems with each particular kind of monitoring.

Given that complexity and that large number of factors and problems, I think it would be a mistake to expect too great progress or too rapid a change from any single move that could be made, and that includes the moves that I suggest in my testimony.

I think something like a national commission might be a useful step in terms of raising the visibility of the subject and perhaps in shortening some of the steps that could be taken to improve it, but I don't think one should get one's hopes or expectations up too high as to how much of an impact that would have, at least in the short run.

In terms of the suggestions that I make in my testimony, I do suggest that the Congress increase the visibility and amount of attention paid to monitoring and suggest that perhaps an annual hearing or series of hearings modeled after the Joint Economic Committee's hearings on the Economic Report of the President might be a useful model to follow to do this.

I talk about possible changes in the Clean Air Act and the Clean Water Act that might encourage increased monitoring. I do want to elaborate for 1 minute on my comments on the Clean Water Act because it is easy for those comments to be misinterpreted.

I think if you allowed waivers from best available technology, if the State standards were adequate and if the monitoring were adequate, then that would be an acceptable and in fact a desirable practice. But what needs to be stressed is that both those conditions have to be met and neither of them are easy to meet.

In particular, the State standards have got to include the toxic substances that are of concern under the Water Act. Most of the State standards do not include toxics now and therefore you cannot do what some have suggested, namely going to a water quality standards based waiver right now.

But if you could get that system working the right way, I think it would give a significant incentive to increased monitoring, and in particular, monitoring by industrial sources.

In terms of organizational arrangements, there are a difficult set of tradeoffs that are faced in any kind of organizational option. I described those briefly in my testimony.

I do think the fact that the best water data network that we have is run not by EPA but rather by the Geological Survey is an important fact to keep in mind as one suggests changes in the system. There are things that are sacrificed if one has the nonregulatory agencies doing the monitoring but there are clearly gains as well.

This raises a question as to the role of NOAA which is a particularly pertinent question now because the White House is, as I understand it, seriously considering converting the Department of Commerce into a Department of Trade and, at least according to this morning's Post, NOAA would be set adrift as an independent agency because it does not fit into a department of international trade.

This poses the possibility, which I discussed briefly in my testimony, of creating an effective resource and environmental science administration or agency or whatever you would want to call it. The new agency should not, I think, or at least not initially, be part of EPA, but should be a separate agency, using NOAA as a nucleus and a core for creating the kind of scientific expertise, including monitoring expertise, that is badly needed.

I suggest the possibility of two new organizations, one an ecological research center, and Jim Reisa addressed himself to that a bit in his testimony before this committee.

We at the Conservation Foundation are working on such a project. A lot of people have tried before and failed. I hope our experience will be different.

In any case, we are consulting widely on the subject and I hope we will make more progress than has been made in the past. The tie-in between ecological research and monitoring is that to know where to monitor and how to monitor you need a pretty good idea of how things travel the environment, how they go from air to water and water to air and so on, and how different things that you want to monitor are likely to behave once they get out into the natural environment. It is really the science of ecology that is best able to give you that kind of information.

Mr. SCHEUER. We have found to our dismay that this whole science of transport is tremendously complicated.

Dr. DAVIES. Well, it is, but if the science of ecology were more advanced, we would know more about transport because the two are really integrally related.

I also suggest creation of a Bureau of Environmental Statistics. I am indebted to Dan Tunstall for this suggestion.

Such a bureau would not actually collect data itself, but would have a function similar to the Bureau of Labor Statistics, namely to serve as a clearinghouse for environmental data, and to assist efforts to coordinate monitoring data and to make the data collected accessible.

The fact that nobody knows what monitoring data are being collected now is perhaps the most telling comment about the nature of the system as it currently exists.

I suggest that within EPA, and Dick Dowd has addressed himself to this, that there be more central responsibility for quality assurance and for monitoring as a whole. We have retrogressed in that respect in the last 10 years.

Originally, the EPA Office of Research and Development was the Office of Research and Monitoring and had central responsibility for those functions. Over the years, it has gradually lost those functions to the program offices.

Finally, let me say something which I touched on in my previous testimony to this committee 1 month or so ago on a related but different subject; namely, insofar as we are dealing with toxic substances which are found not just in air and water but throughout the environment, that changes the nature of the monitoring task to a significant degree. Because with toxics and pesticides and so on, it is not good enough just to know how much is in the water and not in other parts of the environment or how much is just in the air, because you are going to have constant interchanges among the different parts of the environment.

Therefore, I think we are going to have to gradually move toward a system which recognizes the pervasive nature of toxic substances and which recognizes that we need information from different parts of the environment simultaneously rather than just treating water monitoring as a subject totally separate from air monitoring.

Thank you.

[The prepared statement of Dr. Davies follows:]

TESTIMONY OF
DR. J. CLARENCE DAVIES
EXECUTIVE VICE PRESIDENT
THE CONSERVATION FOUNDATION
BEFORE THE
SUBCOMMITTEE ON NATURAL RESOURCES,
AGRICULTURE RESEARCH AND ENVIRONMENT
COMMITTEE ON SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

JUNE 2, 1983

I am very pleased to be here today to testify on the subject of environmental monitoring. The subcommittee is to be congratulated for holding hearings on this vital but usually neglected subject.

I would like to first briefly discuss the need for monitoring data. I shall then turn to an examination of the current state of environmental monitoring. Finally, I will propose some recommendations which the subcommittee may want to consider to improve the current deplorable condition of our monitoring programs.

Need for Monitoring

As the charter for these hearings recognizes, there are different types of monitoring which serve different purposes.

Monitoring data are necessary for enforcement of the pollution control laws. They are an essential part of identifying new problems. They are an integral part of many types of environmental research. We cannot evaluate the effect of existing programs or the need for new programs and policies without monitoring data.

In short, monitoring data and the analysis of that data provide the only basis for a realistic picture of the state of the environment. If we want our environmental policies and programs to be based on reality, they must be based on an adequate monitoring system producing good data which are competently analyzed and communicated in useful form to the appropriate parties. The current system does not meet this description.

Current State of Environmental Monitoring

Monitoring is a political orphan, and this is the reason for many of its problems. The monitoring function tends to be invisible, and at those times when it becomes visible it is often because it tells us something we don't want to hear. Efforts such as these hearings are necessary if the central role and importance of monitoring is to be recognized.

More specifically, we can identify six basic problems with the current monitoring systems.

First, the scientific and technological base for monitoring is often inadequate. The science may not be able to tell us what we should be monitoring and the technology may not be available to allow us to monitor. The best example of these problems is toxic substances. We are not sure which toxics are the most important ones to monitor, and for many toxics, such as heavy metals in water, the technology is not good enough or the good technology is too expensive to measure accurately low concentrations of the substance in the environment, even though such concentrations may be hazardous.

Second, and often related to the problem of scientific knowledge, is that the coverage of existing monitoring systems is often poor. There are two types of problems here. Some aspects of the environment which should be monitored are not subject to any type of systematic attempts to collect data. These include indoor air environments, groundwater, and hazardous waste sites. Other parts of the environment are monitored, but not in a systematic or thorough enough way to give us good information about the status of the problem or about trends in environmental conditions. This is true of most of the air, water, and occupational monitoring that is conducted.

Third, money and incentives for adequate monitoring are lacking. Recent budget cuts have made an already bad situation worse. Analysis and reporting of pesticide residue data has been cut back or eliminated. The Geological Survey's NASQAN network, the only source of national baseline data on water quality, has been cut back. Many other examples could be added. However, on top of budget problems, there are some incentives in current statutes or programs for not doing monitoring. I shall discuss these when I come to giving recommendations.

Fourth, there is the problem of quality control. Typically, data on air and water quality come from a variety of sources, most often state agencies. The different sources use different methods of collecting the data which means that the information cannot be validly combined. Furthermore, even within a single agency or network, there are often serious quality control problems--the location of samplers is not standardized, instruments are not calibrated, laboratory analysis of samples is unreliable.

Some of the most serious quality control problems spring from the fifth problem which is coordination. There are problems of coordination both between the federal government and the states and between or among different federal agencies. As I've already noted, much of the monitoring data comes from state or local agencies, but frequently each agency collects its own data in its own way and thus it is impossible to get a national picture of a problem or to compare the data from one state with that from another.

Within the federal government many agencies are engaged in environmental monitoring of some kind. The Geological Survey probably does more ambient water monitoring than EPA. The National Oceanic and Atmospheric Administration collects a variety of air data. An accessible up-to-date catalog or index of federal monitoring programs does not exist (and one should be compiled, published, and periodically updated), but the Interagency Task Force found more than 150 programs in Fiscal 1978. There is no mechanism within the government (with the now insignificant exceptions of the Council on Environmental Quality and the Statistical Policy Division of OMB) to coordinate the collection or analysis of this data among the agencies.

Sixth, and finally, there are numerous problems with the analysis and use of monitoring data. Unless the data collected are analyzed they are useless and their collection was a waste of resources. And yet a good deal of the monitoring data is never analyzed. When the data are analyzed and interpreted, often the analysis is not as thorough or useful as it should be. For example, water quality data are rarely adjusted for changes in the volume of flow in the stream, which makes it impossible to tell how effective pollution control measures have been. The final step is to communicate the analyzed data to potential users in an appropriate form. Here again, the system often breaks down, with users unaware of data that often are sitting on agency shelves.

Recommendations

The problems of monitoring are so diverse that they do not lend themselves to any grand and sweeping solution. The large number of agencies conducting monitoring, the variety of purposes for which monitoring data are used, and the different types of problems that affect different monitoring systems means that real improvements in monitoring will be slow and difficult to achieve. There are, however, some important steps that can be taken.

If the relevant congressional committees paid more attention to national ambient data on environmental conditions and trends, it is likely that the quality and timeliness of such data would improve. The annual reports of the Council on Environmental Quality (CEQ) are intended, by statute (the National Environmental Policy Act of 1969), to be the authoritative compilation of such data. A process modeled after the Joint Economic Committee's review of the annual economic report of the president could usefully be applied to the CEQ reports. This would involve annual hearings, announced and planned well in advance, on the state of the environment. The hearings could be held just by this committee, but ideally they also would involve the environment committees in both houses.

Several changes in either the pollution control statutes or EPA regulations would provide significant added incentives to collect monitoring data or improve the quality of the data collected.

EPA has interpreted the Clean Air Act provisions on compliance of air quality control regions with national ambient air quality standards to mean that if no monitoring data on a pollutant are available from a region then the region will be considered in compliance for that pollutant. This gives regions an incentive not to monitor. The assumption should be reversed. If no data are available from a region the region should be considered to not be in compliance for the unmonitored pollutants.

The Clean Water Act could be changed to provide an important incentive for ambient monitoring. Industry has argued that EPA should allow waivers from the Best Available Technology (BAT) requirements if water quality standards can be met without installing BAT controls. Such waivers make sense if, and only if, the states have established adequate standards (particularly including coverage of toxics) and ambient monitoring is reliable enough to establish compliance with the standards. If such waivers were permitted under these conditions there would be a significant incentive for more water quality monitoring.

Grants to the states under both the Clean Air and Clean Water Acts do contain some conditions relating to monitoring. However, these conditions could be strengthened so as to insure quality control over the data. Similar steps probably could be taken under the permitting provisions of the Resource Conservation and Recovery Act.

There are no simple prescriptions or solutions for the best organizational arrangements for monitoring at the federal level. Enforcement monitoring has to be done by the enforcement agency and research-oriented monitoring usually must be done by the scientists who will use the data. Monitoring done to evaluate progress will be done more objectively by an agency not responsible for the regulatory programs, but if it is done by an outside agency the results are less likely to be incorporated in program evaluation and planning. The non-regulatory agencies are likely to attract better scientists and to devote more attention and resources to functions like monitoring, but the regulatory agencies have more leverage over the state and local agencies that provide a large part of the data.

The fact that the best network for obtaining and analyzing monitoring data on national ambient water quality trends is the NASQAN system of the Geological Survey, a non-regulatory, primarily scientific agency, is instructive. Serious consideration should be given to establishing a similar capability and responsibility for ambient air quality monitoring in NOAA.

Two new organizations, both discussed in the 1980 CEQ report, are needed. One is a national ecological research center, to conduct and have central responsibility for basic ecological research. Jim Reisa, in his testimony to this committee a couple of weeks ago, mentioned the numerous attempts to create such an institution. The Conservation Foundation, as part of its New Environmental Policy project, is trying once again, and we are in the middle of conducting the analyses needed to make such a proposal substantively and politically viable.

The second organization is a Bureau of Environmental Statistics, with a function for environmental data similar to the Bureau of Labor Statistics for economic data. The Bureau would serve as a clearinghouse for environmental data, assisting efforts to coordinate monitoring efforts and, most importantly, making the data that are collected accessible.

The administration is currently considering reorganizing the Department of Commerce into a Department of Trade. If this were proposed and were to take effect, NOAA would no longer fit in the department. This, in turn, raises the long-term possibility of an Environmental and Resource Services Administration, composed of NOAA, parts of USGS and perhaps NASA, the proposed Bureau of Environmental Statistics, and perhaps a National Ecological Research Center. I am only suggesting this as a possibility, not recommending it. We have not done the extensive research that would be necessary to determine whether such an organizational scheme made sense when examined closely.

Within EPA, what is now the Office of Research and Development was originally the Office of Research and Monitoring. Over time, the monitoring responsibilities in the agency increasingly gravitated to the individual program offices, and the ability to coordinate monitoring efforts and to ensure quality control on an agency-wide basis was increasingly weakened. Efforts should be made within the agency to reassert some degree of central control, but if such efforts are to succeed they will need to get strong support from this committee.

Coordination of monitoring efforts, especially within EPA, will be increasingly important in the coming years. As attention shifts from gross pollutants that are limited to a single part of the environment (such as suspended solids in water or carbon monoxide in air) to toxic substances that can be found in all parts of the environment, it will be increasingly necessary to link diverse monitoring efforts and to analyze data from different media in a unified way. To know what the levels of mercury or PCB's or aldrin/dieldrin are in a river will not tell us much about the success of control efforts or about what further steps need to be taken. We will also need to know how much is in the air and in groundwater and in various parts of the food chain, and how much of what forms of the substance are being transferred among different parts of the environment.

We are a very long way from this type of integrated approach. As The Conservation Foundation stated last year, current monitoring data are not sufficient to describe accurately the extent or developing seriousness of any environmental problem. But as efforts are made to improve the data, the need for a more coherent and coordinated approach to environmental management should be kept in mind.

Mr. SCHEUER. Thank you very much, Dr. Davies.

Congressman Lewis from Florida.

Mr. LEWIS. Thank you, Mr. Chairman.

Do any of you four gentlemen feel that you collectively could come up with a monitoring system that would be acceptable to each and every one of you?

I am going through your testimony and previous testimony. I feel even the witnesses who are testifying have a problem agreeing among themselves what would be a good monitoring system. Do you think that the four of you could come up with a system that would be acceptable to each one of you?

Dr. Davies.

Dr. DAVIES. If I could comment on that, I have been impressed—and I have read the testimony that has been given in the previous 2 days of hearings—I am impressed as to how much unanimity there really is in terms of what is wrong with the system.

The recommendations have been fairly diverse, but my impression is that that is not because we disagree so much as because it is not really accurate to talk about a monitoring system.

You have got so many different kinds of monitoring done by so many different agencies in so many different ways—State and local, different parts of the environment, different kinds of contaminants for different purposes. I suspect we could agree on a monitoring system but it would be a long and arduous process.

The reason for the diversity of the recommendations, as I say, is not because we disagree but because we are looking at different kinds of monitoring and different parts of the system.

Mr. LEWIS. Does anyone else want to volunteer a comment on that?

Mr. MILLER. I think one of the problems is that even though the various environments we are talking about, ground water, air, surface water, are all part of the integrated system, the approach on how to monitor each one is very different.

As I mentioned before, the approach to monitoring ground water is a completely different approach than one you would use to monitor surface water because it is a very site specific problem. The flow is completely different and the transport that you talked about in ground water, there is no mixing.

Your problems are very limited in area, size, so it is a very different approach. So maybe there is some confusion over separating out one type of environment to another and how you would go about monitoring each one.

One source may be adaptable to a national scope whereas another type of environment, such as ground water, is not really adaptable to a national monitoring approach.

Mr. LEWIS. Dr. Dowd.

Dr. DOWD. I think there is another issue here, too, and that is that to a large extent the private sector has not been involved in the debate that has gone on in the Government over the last 10 years partly because it has not had easy access to the systems that the agencies use to gather and allow retrieval of the data.

I think that while we probably could not agree on every jot and title, I think we probably could get 80 or 90 percent of the way between a group here or the group of people that participated in the hearings in the first 2 days of session.

Let me just give an example. I think virtually everyone who has viewed the list of priority pollutants for water agrees that you probably do not need to measure every single one of those chemicals at every single location. I think you could probably get almost any group of individuals who have a strong interest in and involvement with environmental science from industry to environmental groups to agree on about 80 percent of the list and you could probably get it after a 2-hour session together sitting around a table. You would still have some difference of opinion on 20 percent or 10 percent of the list, but you could get a consensus that would get you very, very much closer than we are today, I think, fairly quickly.

Mr. LEWIS. Thank you.

Mr. Norris.

Mr. NORRIS. Congressman Lewis, I would agree with the statements my colleagues made. I think everyone at this table has a technical background. If you were to lock us in a room and say "you don't come out until you come up with a system," I have every confidence that we would come up with a system.

I would have to agree that perhaps it might be only 80 percent mutually acceptable, but we could work out the remaining 20 percent. So I think your example is quite a good one.

Basically if there is a good faith adherence to the concept of good science, of trying to find out really what is there and using the best state-of-the-art methodology and acknowledging the limitations of that best state-of-the-art methodology when it is inadequate, then I don't think we would have any real big problems.

Mr. LEWIS. The chairman was alluding to problems with the private sector where the private sector should be involved. Do any of you gentlemen feel that the private sector could do a better job than the Government could do or do you feel that there can be a cohesiveness between the private sector and Government as far as coming up with a monitoring system?

Mr. Miller, I am a little bit more familiar with the ground water system than some of these other things.

Mr. **Miller**. Well, the private sector is already heavily involved with ground water monitoring because most of the monitoring that is going on in ground water is in response to regulatory controls, such as the Resource Conservation Recovery Act, and that requires that the private sector put in monitoring wells and take water samples and report that information to public agencies.

So I would say that the major money that is being spent on monitoring today is being spent by the private sector and not the public sector.

Some of the other monitoring that is being carried out is really—logically should be carried out and continues to be carried out by local agencies on a county or State basis because the concerns vary from place to place, and the uses of ground water and aquifers vary from place to place, as illustrated in Florida.

So there are certain aspects of ground water monitoring that will never go to or belong in the private sector.

Mr. **Lewis**. And it is your opinion that more money is being spent by the private sector in monitoring than in various Government agencies?

Mr. **Miller**. At the moment, sure. And this will continue to happen in response to the regulations that are being adhered to or that are coming about based on the control of hazardous waste and in response to the requirements, Superfund, et cetera.

Mr. **Lewis**. I think it is very interesting that you say that.

I have a lot of questions in my mind. If the private sector is doing the monitoring and spending more money at this point, why are we having so many problems in some of these areas with the private sector as far as the ground water infiltration problems that we have?

Mr. **Miller**. Well, what you are dealing with or the problems that you are looking at are old problems. You are now finding them but the contamination itself took place over a period of many, many years.

Again, this is the result of the very slow movement of ground water, the fact that it is a hidden source. The problems you are referring to are being discovered because we are now putting in monitoring wells in ground water which we never used to do.

The amount of monitoring in ground water that has occurred and most of the ground water monitoring that has happened in this country has happened over the past 5 years or so. So what we are looking at is a lot of problems but we are discovering them.

That does not mean that the problem occurred 5 years ago or today. You are measuring things that entered the ground 10, 15, 20 years ago.

The major ground water problems in the coastal plain of the United States and in such areas as Ohio, Westchester, and Florida are surface water impoundments that leaked 10 years ago, 20 years ago.

Mr. **Lewis**. Isn't it a situation, though, where we are finding some of the elements that filtered into ground water systems in the past 10 or 15 years were considered safe compounds 10 years ago and today we find that they are carcinogenic?

Mr. **Miller**. Oh, yes. It is sort of a moving target as far as what we feel is dangerous and not dangerous. Up until not too many years ago, we paid no attention to organic chemicals in ground water.

In fact, there were many people in the ground water field that felt that ground water was safe from organic chemical contamination. We found that is not the case, definitely not the case. So we are learning.

Mr. Lewis. Dr. Davies, in your testimony, you stated that we needed an organization called the Bureau of Environmental Statistics with a function for environmental data similar to the Bureau of Labor Statistics. Can you provide more detail on what this bureau would do?

Dr. Davies. Well, as I say, primarily it is a way of making the data accessible.

One of the main problems now is that we do not use a lot of the data that we have. A lot of data is collected. People don't know it is there.

Agencies initiate their own monitoring programs because they don't know that data is in some other agency that could, in fact, serve their purposes. People outside the Government have no way of finding out what data is available or how to get it. So we are not, by a long shot, making maximum use of the monitoring data that we have now.

I frankly cannot give you a lot more detail because we have not researched how large it would be or what it would cost or those kinds of questions. We have not yet done that research, although we intend to.

It would be a cost-effective organization, I think, because it would make the money that we are putting into monitoring now pay off a lot more than it currently does.

Mr. Lewis. Would you want to venture to say how this Bureau of Environmental Statistics would relate to OMB statistics policy?

Dr. Davies. My understanding is that currently the Office of Statistical Policy in OMB has one person part time dealing with resource and environmental statistics. OMB was used as a coordinating mechanism and one could revive that function again with respect to resource and environmental statistics. But it has been pretty well gutted at this point, or ignored, or whatever verb you want to use.

What OMB would not be very effective in doing is getting the data out to potential users. I don't think OMB is well suited to do that so you would still need some sort of mechanism for doing that part of the function.

Mr. Lewis. Mr. Norris, on page 4 of your testimony, you state that the establishment of a national environmental monitoring board is not necessary and areas of concern to CMA can be adequately addressed through EPA's program office responsibility and research.

However, at points in your written statement, you refer to inadequacies in monitoring networks concurrent with results of GAO studies which criticize EPA and refer to inadequate guidance from EPA and state that EPA has not developed standard practices equipment or protocols.

Other witnesses have complained about the fragmentation and lack of coordination within EPA itself. Under these circumstances, why should this subcommittee believe that all of the problems will be taken care of by EPA's research and program offices even with additional funding?

Mr. **Norris**. I believe that the lack of cohesiveness in EPA's program resides in the fact that there is not a cogent policy.

If the Office of Policy and Resource Management were to establish a cogent policy for monitoring, analysis, the using of the data which is acquired, and if they were given accountability to make sure that they coordinated their efforts with other Federal agencies and, in turn, had the support of the Office of Research and Development of EPA, then I think the accountability for environmental measurements would stay, in my own personal opinion, right where it needs to be with the Environmental Protection Agency.

I certainly see the merits of Dr. Davies' recommendation with regard to the establishment of a Bureau of Environmental Statistics. But I really think, if we can draw on Harry Truman again, I think the buck stops with EPA. I think EPA has been given the congressional mandate to secure and to establish the necessary rules and regulations to assure a good environment for everyone here in the United States.

I really feel that to establish another organization for the acquisition of the data and for the promulgation of that data probably somewhat defangs EPA. I really don't think that is the appropriate course of action to take.

I think, again, if the Office of Policy and Resource Management establishes a good, strong policy and is directed to coordinate this policy with other agencies that acquire data and has the necessary technical fiber provided by the Office of Research and Development, I think we will have a good operating system.

Mr. **Lewis**. How would your recommendations also take care of the monitoring problems outside of EPA, such as NOAA and the U.S. Geological Survey?

Mr. **Norris**. It would be this coordination that perhaps the Congress could make its intent known that with regard to these sorts of measurements, monitoring and so on, that EPA is indeed the organization that should have the policy. It is the organization that should work in close cooperation with these other Federal agencies.

So really the heart of my comment goes to establishing a good coherent policy within EPA with the blessing of the Congress.

Mr. **Lewis**. Mr. Miller, in your testimony, you stated that some enlightened water suppliers implemented programs to track trends in groundwater quality and quantity, but their interests have generally been limited to wells, watershed, and recharge areas.

What coordination, if any, has taken place between these water suppliers to develop open, common data screening methods and statistical techniques?

Mr. **Miller**. I would say probably very little from the standpoint of trade of information from one utility to another utility.

There are some areas in the country where counties and States—but this is by no means universal—have provided guidance to utilities using groundwater in their particular region from the standpoint of asking them or cajoling them to do certain kinds of monitoring from the standpoint of what sources may be affecting their wellheads, finding out what may be affecting the recharge areas of their groundwater system that they are tapping, but it has been not uniform by any means.

However, there are certain areas, especially those where we have seen problems or problems have been discovered where the utility operators are going ahead and are putting in monitoring wells and trying to anticipate problems before they happen or developing some trends. But it is not uniform by any means, nor are there any standards set for how to collect the information or how it will be used.

Mr. Lewis. Are you aware of any efforts whatsoever to develop information from suppliers so conclusions can be drawn about groundwater quality throughout the country?

Mr. Miller. On a regional basis, yes.

For example, Nassau County contributes or supervises the sampling of 450 community wells and that information is being used to attempt to determine trends, to attempt to come up with a better planning for land uses in the area to develop better patterns of pumping.

There are certain States, mostly in the East like Connecticut and New Jersey, where information from sampling of public supply wells and private wells is being used as a basis for some decisions in land use planning and the control of diversion rights.

Mr. Lewis. Dr. Davies, do you feel that the change at the head of the EPA, the new Administrator is going to make a difference in the attitude of the EPA as far as the application of the congressional mandate?

Dr. Davies. The congressional mandate for the agency as a whole or with respect to monitoring specifically?

Mr. Lewis. For monitoring.

Dr. Davies. I am really not sure. I am very hopeful in terms of Mr. Ruckelshaus' impact on the agency as a whole. He has got so many things to deal with, I guess I am concerned as to where monitoring will sort out in his priorities.

He has a short period of time to do a great many things and I am hopeful that the changes he makes will improve the monitoring abilities of the agency as well as a number of other things, but I think that remains to be seen.

Mr. Lewis. Do you think, Mr. Miller, that groundwater will be one of the top priorities of EPA as far as monitoring groundwater under the new regime?

Mr. Miller. I don't know. It should be and probably will be simply because the regulations are now out for the groundwater portions of RCRA and because most of the Superfund sites and the Superfund money that is being spent involves groundwater problems primarily as the portion of the environment that has been affected by these sites.

Mr. Lewis. Thank you, Mr. Chairman.

[Discussion off the record.]

Mr. Scheuer. Mr. Norris, my preparation back a little ways came to naught because you did not tell me how we could involve industry more constructively. Maybe I ought to just ask a specific question.

One of the previous witnesses has recommended creating a framework in which institutions like universities or individual businesses could take part in ambient monitoring of toxic substances. I am going to ask you a whole lot of questions.

Do you think industry would agree to involve themselves in this kind of an effort and under what circumstances?

What kind of ground rules would they like to see?

What can we do to encourage industry participation, for example, in selecting which substances to monitor and designing the monitoring networks and setting standards cooperatively with EPA perhaps and maybe some university inputs too, in defining analytical methods and defining quality control procedures?

I simply restate for you that we know there is a great deal of talent out there. We know there are brilliant creative minds at work creating all these toxic chemicals. I don't think they just want to be part of the problem. I am sure they want to be part of the solution too.

We have not been able to evoke the kind of response that we would have hoped for and I, for one, take full blame. Congress has not done its job.

How can we improve our performance? Can we create a political, legal, and legislative environment which will evoke positive environment, voluntary involvement from industry so that they will help us diffuse the environment and health impacts of the products that their genius has created which are helping the American people, which are improving the quality of life?

Can we get a response from you?

Mr. NORRIS. Mr. Chairman, the many very good questions which you ask would require the wisdom of Solomon to be able to respond appropriately.

I can only tell you, and I think my CMA colleagues would back me up on this, that industry would be glad to participate in a toxic monitoring program—absolutely glad to participate

The conditions would be, if we can call them conditions, that we would like to contribute to the establishment and the foundation of the program, to be in on the ground floor. We do have technical expertise. We do have capabilities and we would be glad to participate with all interests including environmental groups.

There are many good scientific minds in the environmental groups, very good scientific minds within the Agency and also within industry. So I think if we could be in on the ground floor in the development of the program, you would see very great potential for industry involvement.

There is some precedence for this. For example, the State of Virginia, I understand, and industry have a voluntary program under which industry is monitoring the presence of toxic pollutants for water quality purposes. And industry, using its own expertise, is selecting those analytical methodologies and techniques, which its experience tells it works, and is running this by the State of Virginia to obtain their approval. So the precedents are there.

This sort of cooperation, I agree with you, is something which is definitely needed. But getting back to again your original question, I believe industry needs to be brought in on the ground floor.

This is what we propose to do as a matter of national concern and by congressional concern. What can you guys do to help us?

I think you will see an organization like CMA taking the lead.

Mr. SCHEUER. Well, I think we are both asking that question of each other because there is a great national need out there for us to stop acting confrontationally and start acting like intelligent adults whose talents ought to be combined and joined to meet a pressing national problem that so far we have not met to the clear detriment of the health and the environment of the American people.

It seems to me we have an obligation to work with each other and it should not be all that painful. I think when we started the process, we might even find that it was enjoyable.

So let me thank you for that response. It is encouraging and I will be in touch with you informally. Maybe we can meet with some of your top people informally, not in a structured hearing setting, but over breakfast or dinner or something of that kind. Tomorrow we definitely want to pull you into that.

Mr. NORRIS. Thank you.

Mr. SCHEUER. Now, Mr. Dowd, you mention in your testimony that EPA had gotten a start in monitoring metals in the air through its inhalable particulate network but that EPA is now closing down the entire network because of budget reasons.

The actual figures are absolutely horrifying. Originally there were 165 sites across the country. It is down now to about 70 sites. By the end of the year there will only be 11 stations monitoring inhalable particulates and by the end of 1984, this monitoring network will be closed down entirely.

Can this be true?

Dr. DOWD. Yes, sir. I had called, in fact on Friday, just to make sure that the number in my testimony that I had originally written was correct, and I had about 150.

I was just trying to check it because, in fact, I have in my office a printout from all of the inhalable particulate networks for the first 3 years which started up at about 65 stations and moved up to about 165. I was just trying to make sure what the current number was. Was it 167 or 92 or whatever.

I was told that, my recipient said, "Did you want to know how many we had up?" I said, "Yes. How many was that?" It was 165.

But my ears perked up and I said, "How many are there actually operating now?" And he said, "Just a second; I'll check." He said, "There are 70." He said, "That is not so terrific. That is a surprise."

I did not realize it was going down. He said, yes, because the Office of Air Quality Planning and Standards decided they only needed 1 year's worth of data to determine some of the things that the research portion of the inhalable particulate network had been put in place to do, and that by the end of 1983, there would only be 11 sites operating and in 1984, those 11 would be eliminated as well.

Indeed, I was told that the resource constraints are so large that the equipment is not even being sent back to the research triangle park at the moment since there is not any money to ship it back. The people who have the equipment were told to keep it onsite and when we get some money we will ask for it to be sent back.

So in my view, it is a terrible issue. It is the only national network to get a handle on these elemental compounds. There are lots of problems with that as you can understand, because, after all, the elements themselves come in different compound shapes and one does not know what that is.

But nonetheless, it has potential for being a very high quality network that would give us the first long-term look at where the kinds of metals in the environment that are on the list of potential hazardous air pollutants that the Agency has been asked by Congress to evaluate to determine whether or not they are hazardous.

One of the two issues the Agency established in its policy on hazardous air pollutants at the end of March is that exposure is a large contributor to that decision. It is very difficult for me to determine how one can assess exposure at all if you don't have any evidence whatsoever about what the concentrations in the air are. I would suggest that a single year's data is not sufficient to understand it at all.

I am very unhappy with that. I think the Agency is losing an enormous opportunity, for once to be ahead of the game and be able to make some good decisions ahead of time as to whether or not these concentrations are serious or not. If you don't know the data, you just simply don't know the answer to that question.

Mr. SCHEUER. I am really appalled by this testimony. Would any of the rest of you want to comment on this closing down of the network for monitoring inhalable particulates? Dr. Davies?

Dr. DAVIES. Well, I share the attitude of Dr. Dowd and of you, sir. And it is not, unfortunately, an isolated example. It may be one of the more egregious examples of the budget cuts impacting on the EPA monitoring programs, but it is certainly not the only example and it is not limited to EPA either for that matter.

The NASQAN network of USGS which is, in fact, the only national water quality monitoring network, has cut back the number of stations for 2 years running now, and it is slated to be cut back even further solely because of budget reasons in fiscal year 1984.

The mussel watch program, which began like the inhalable particulates network, was experimental in nature, but again, like the particulates network, was the only system of its kind, the only thing measuring the amount of toxic organics along both the east coast and the west coast. That also is slated to be put totally out of existence, I think, this year, I guess in fiscal 1983.

So, you have unfortunately a number of examples and, of course, one of the characteristics of these kinds of programs very often is that once you lose continuity, you never regain that and you cannot go back and get the data for the years that you have lost.

Mr. SCHEUER. I just want to make sure that I understand this situation. We are going from 165 monitoring sites for inhalable particulates down to zero.

Dr. DOWD. Yes.

Mr. SCHEUER. Is any other system for monitoring inhalable particulates being substituted for these stations, or have we abandoned in principle the whole business of monitoring inhalable particulates in the air?

Dr. DOWD. I think the idea was ultimately that such a monitoring should be turned over to the States and the local agencies who operate most of EPA's air network. And insofar as the inhalable portion of it, it may, in fact, happen. The agencies worked on attaching new tops to the equipment so that they will reduce the size of the particles that are picked up by the high volume monitors that the agency has been using for some years.

However, that will not be possible, I think, to carry out measurements of the metals in the same manner with the same level of confidence of data and certainly there will not be the kind of coverage because, as you know, State grant funds, themselves, get reduced over time; States are not anxious to pick up additional tasks that they have not been paying for heretofore.

So that I think also the agency may have in mind giving some of this over to the States, they are shutting down essentially a going concern, one that has data coming in on a routine basis, that is, although it is quite high quality.

Mr. SCHEUER. There is an old adage of government that is being violated, and that is "if it ain't broke, don't fix it." This system ain't broke and it is being not only fixed; it is being destroyed and it is hard to justify that.

[Discussion off the record.]

Mr. SCHEUER. The only conceivable explanation of why this administration should be closing down these inhalable particulate monitoring stations would be if Republicans don't inhale the air. Do you know of any physiological phenomena which would indicate that Republicans don't breathe the same air that we Democrats breathe and, therefore, are not subject to the same dangers? I want you to give us a very thoughtful answer.

Mr. LEWIS. Mr. Chairman, my experience has been—I could tell you a joke about that, but not on the record.

I think that the record will reflect, and the data, that we do breathe the same air. The only difference is I think that we drink different whiskey.

Mr. SCHEUER. I take it rich people breathe the same air that poor people breathe?

Mr. LEWIS. I would say that the rich people breathe a better quality of air than poor people.

Mr. SCHEUER. And drink a better quality of whiskey?

Mr. LEWIS. Yes.

Mr. SCHEUER. All right.

Let me ask Dr. Davies. You stated in your testimony that monitoring of toxic substances was an example of science not being able to tell us what we should be monitoring and technology not being available to allow us to monitor. What do we need to do to be in the posture that science will tell us what to monitor and that technology will enable us to get on with the job of doing that monitoring?

Dr. DAVIES. Well, I guess there are several requirements. The first and foremost is money. It is going to take a lot of money to answer those questions.

Mr. SCHEUER. What do we need besides money to improve our monitoring of toxic substances? If we reestablish this system, which apparently was closed down from the exigencies of shortages of funds, is there anything else we should do? Is it just purely a funding problem?

Dr. DAVIES. No, I think there are a number of other things that could help. Partially it will depend on the regulatory system. Insofar as we get serious about regulating toxics, then monitoring requirements and monitoring for compliance will follow. We have really done very little regulating of toxics so far, so I think that is a second thing that will impact on the system.

Third, I think is something we have discussed here today which is the involvement of industry. Industry has a major concern with toxics, and inasmuch as you succeed in getting incentives for good quality data coming from industry, I think that will have a significant impact also.

Mr. SCHEUER. I would like all of you to answer the question that by implication you raised. You said, I guess quite correctly, that we have done very little regulating on toxic substances, and we don't have the knowledge to do it apparently. I mentioned to you the New York Times today. After all these years, after knowing about dioxin for 20 years or more, the Dow Chemical Co., is now going to do a study, they announce with a press release from Midland, Mich. They are now going to do a study.

Why is it that we haven't accrued the knowledge to regulate, and why is it that we haven't regulated toxic substances? We are supposed to be an advanced, developed society. Why have we done so badly in this respect? This will be the last question of the day before we go and answer this rollcall vote.

Maybe if you could each give us a brief answer, that would be an excellent question to close out the hearing.

Dr. DAVIES. Well, let me say a couple of things. One, the state of the science is clearly a problem. One of the main end effects we are concerned about is cancer, and we still don't know what the biological mechanisms of cancer are, although we have made tremendous advances in a short period of time.

If you don't understand what causes the effects that are of concern, it is difficult to know which substances you ought to be looking for. We don't really have a good fix as to how much of what kinds of cancer may be caused by various substances. If we knew basic science in terms of toxicology and mechanisms and so on, we would be way ahead of the game.

Second, I think we have to recognize how recently the problem has been identified. We have really only been concerned about toxics, with the exception of pesticides within the last 7 or 8 years. That is a very recent problem. Things don't move that fast.

Third, though, I think there clearly are political problems, and if you look at the laws that we have passed to deal with addressing these problems specifically, the Toxic Substances Control Act, for example, there is a certain resistance to going too far or giving the Government too much power to deal with these problems.

Mr. SCHEUER. Anybody else? Mr. Norris?

Mr. NORRIS. I certainly concur with some of the points that Dr. Davies made. I think the state of the art, the state of the science is a limiting factor. Another variable too is some question of credibility among those lists of toxic substances that we have seen.

Simply speaking now as an individual, when I look at appendix VIII and look at those compounds which are to be monitored in ground water and I see saccharin on the list, you must forgive me if I believe that there is some lack of credibility in some of the choices, or when I see mustard gas or a number of other particular compounds which simply cannot continue to exist as those species in water.

For example, one is acetyl chloride. Its half life in water is 1 split second.

One of the difficulties I think is that the lists which we look at as toxic sometimes lack an inherent credibility. It is difficult to get excited about looking for saccharine in ground water.

Dr. **Dowd**. Mr. Chairman, I think there is another issue here and Dr. Davies referred to that earlier, and that is the fact that information is often kept as a light under a bushel. Take the inhalable particulate network. I dare say that some of the measurements there and some of the techniques have uncertainties that are somewhat larger than one might like to have.

However, had that network been really pressed and issued so that people like the CMA could criticize it in a scientific fashion and say, "Wait a second, don't take too much for granted; let's have a discussion about it and really deal with the issues that have to do with the methods," et cetera, not only would we all have understood better what is really there and create a constituency for the information, but the information would be in the process of getting better.

After all—one of the scientific methods is, if not self-criticism, at least peer criticism, and you know when you put something out that you have to be careful because it has to be right.

Much of the monitoring network certainly that EPA runs is not subject to that kind of criticism and therein I think lies one of its truly frightful flaws.

Mr. **Miller**. Just a short comment. This is one of the areas where there should really be research carried out. As far as the ground water field is concerned, there are wells being shut down in various parts of the country all over the country based on drinking water standards, based on toxic element drinking water standards that have very little basis, if any in fact, or in research.

This is costing the taxpayers a tremendous amout of money, and we really don't know whether we are in danger or not in danger. So it is a piece of research that is really missing and emphasis should be placed on that.

Mr. **Scheuer**. Thank you very, very much. This has been an outstanding and informative hearing.

The hearing is adjourned.

[Whereupon, at 4:15 p.m., the hearing was adjourned, subject to the call of the Chair.]

APPENDIX

Questions and Answers Submitted for the Record

MR. WALTER A. LYON

Question 1 --

In your testimony you used the phrase National Environmental Monitoring Program.

a. Please explain what you mean by a National Environmental Monitoring Program. What are its goals? What is it made of? What roles do the Federal government, state and regional agencies, industry, academia, environmental groups, and others have in a National Environmental Monitoring Program?

Answer --

This question is partly answered in my written testimony. The questions regarding roles need to be more specifically answered by the Commission which I have proposed. These roles may change over time and with reference to the pollutant and the element of the environment. It is an important question, but it needs to be studied in much more detail than has so far been done.

b. What benefits are there from an effective National Environmental Monitoring Program?

Answer --

The benefits of the program fall into both the economic and environmental sectors. The program would lead to more effective intergovernmental cooperation in the environmental field and therefore increase the effectiveness of every governmental dollar spent on environmental programs. The program would allow and encourage regulations which would assure the most cost-effective approach to environmental controls to minimize costs in the abatement of environmental pollution and enhance program progress.

Question 2 --

You have mentioned that the importance of an effective national environmental monitoring program has been highlighted repeatedly during the past twenty years. Why, in your opinion, are we continuing to have the same problems in environmental monitoring that we have had for so long?

Answer --

I believe that we have made no progress in unifying environmental monitoring because neither the Congress nor the Executive Branch have paid enough attention to the problem. Managing the environment is a very new and complex enterprise and Congress has wisely chosen to deal with each element of the environment such as air, water, and toxics separately. This has been a very intense and controversial effort. This is why the overriding management aspects have been overlooked.

Question 3 --

In your testimony you state that monitoring requirements are highly fragmented at the Federal level, and that this fragmentation is imposed upon the states.

a. Please give some more specifics on an example of this fragmentation, and show exactly what impact this causes on the states.

Answer --

This fragmentation exists between programs such as Surface Mining, Water Quality, Air Quality, Toxics, Drinking Water, Data Collection such as USGS and program elements such as source monitoring, quality assurance, data collection, laboratory services, data analysis and reporting.

Except for very meager efforts in CEQ, USGS and a very small Toxics Intergration program in EPA there is no encouragement by any Federal agency to unify environmental monitoring at the state level.

The excessive detail in monitoring requirements by various Federal programs would probably effectively prevent any comprehensive effort to unify environmental monitoring at the State level. The extent of this problem could only be determined after more careful study than has so far been devoted to this subject.

The impact on the states of this fragmentation is primarily economic but it also affects the pace of program progress. It means that state programs are less efficient and less capable of being managed in accordance with the geographic and environmental differences between states. This imposes unnecessarily high state and Federal budget costs in relation to the results being obtained. It also prevents better management approaches vis-a-vis a single source of pollution such as an industry or a municipality, where multi-modal inspections and monitoring would allow a more cost effective approach to dealing with a given pollutant.

b. Is it your understanding that other states in addition to Pennsylvania are having these same problems due to the fragmentation of monitoring at the Federal level?

Answer --

Yes, I believe other states have similar problems in this regard.

c. What specific recommendations do you have that would solve or lessen this problem?

Answer --

The inclusion of States in a major way in the work of the Commission which I have proposed and also in the workshops which I have proposed will help to solve or lessen the problem. It is also obviously important that the leadership in the Commission and its staff must given this problem adequate priority.

In the past, efforts such as this have floundered on the rock of federal preeminence -- that lack of willingness on the part of Federal officials in this field to share the process of policymaking in this field with the States. For example, the CEQ Task Force on environmental monitoring did not include state representation; the USGS Water Data Coordination effort has separate Advisory Committees on State/local and Federal water data matters.

Question 4 --

You have recommended establishing a commission to develop a national environmental monitoring program, and to conduct annual workshops on environmental monitoring. Do you have any additional details you would like to relate regarding this commission? Who would be on the commission? Would there be a lead agency? How would findings and recommendations be carried out? Would it be only advisory, or would it also have some authority to implement its decisions?

Answer --

Clearly the recommendations of the Commission need to be implemented by the lead agency and it needs to be given adequate powers to do so. Its role in relation to other Federal agencies, the states and local agencies should be defined by the Commission after considerable careful study. This is a very complex task and affects not only the existing authority of EPA and Interior but also the function and authority of CEQ and any agency which may acquire responsibility to coordinate water matters within the Federal establishment.

There will clearly be need for continuing policy coordination after the commission completes its work. Whether or not the Commission should carry on this function or its membership be modified should be subject to review at that time. The Commission itself may have some recommendations in this regard. The implementing agency clearly will need a body of this type for policy but not administrative purposes. A range of options needs to be considered and the extreme end of the range should be the possibility of combining monitoring with policymaking in a Commission that assumes the regulationmaking powers of the Administrator of EPA, Secretary of Interior, CEQ, and so on. Also the program scope of the effort needs to be defined; for example, to what extent should the regulation of water use and quantity be included?

Question 5 --

In 1978 the predecessor to this Subcommittee considered developing a Prototype National Environmental Monitoring Management System to provide dependable scientific data and to investigate how to organize, store, process, reduce, and otherwise handle vast quantities of numerical information. Would you recommend such a prototype now? If so, what could we expect to learn from a prototype? What should be its focus?

Answer --

The mission of the Commission should include research, demonstrations, training and prototypes. To make this effort merely a prototype is simply and completely inadequate to address this complex problem. The approach should be one of gradualism where the notion that experience and results are the guidepost for the future is a given.

Question 6 --

Do you have any other suggestions that you would like to make that would lead to improvements in environmental monitoring?

Answer --

It would be a mistake to think that this is an easy effort where the simple passage of a bill and the creation of a Commission would deal with this very complex problem. It will require continuing attention by the Congress and the Executive Branch and a great deal of continuing consensus-bulding as experience is gained. It will also require strong and capable leadership with a strong scientific involvement.

QUESTIONS FOR DR. JAMES J. REISA

1. THE CEQ REPORT PROVIDED THIRTEEN SPECIFIC RECOMMENDATIONS FOR IMPROVEMENT IN ENVIRONMENTAL MONITORING, OVER HALF OF THEM RELATING TO COORDINATION ISSUES.

   o DO YOU BELIEVE THAT THE RECOMMENDATIONS ARE AS VALID NOW AS WHEN THE REPORT WAS RELEASED?

   o WHAT, IN YOUR OPINION, ARE THE MOST IMPORTANT RECOMMENDATIONS?

2. THE CEQ REPORT STATES THAT "CEQ WILL WORK WITH APPROPRIATE INDIVIDUAL AGENCIES TO IMPLEMENT THE RECOMMENDATIONS BY DEVELOPING SUITABLE IMPLEMENTATION PLANS."

   o ARE YOU AWARE OF ANY PROGRESS THAT CEQ HAS MADE IN WORKING WITH THE AGENCIES TO IMPLEMENT THE RECOMMENDATIONS?

   o DO YOU BELIEVE THAT CEQ IS NOW ABLE TO CARRY OUT WITH THE STATES THE IMPLEMENTATION OF THE RECOMMENDATIONS, IN VIEW OF CEQ'S CURRENT STAFFING AND FUNDING LEVELS?

3. YOU HAVE HEARD MR. WALTER LYON EXPLAIN WHAT HE WOULD LIKE TO SEE IN A NATIONAL ENVIRONMENTAL MONITORING PROGRAM. YOU HAVE ALSO HEARD MR. LYON RECOMMEND ESTABLISHING A COMMISSION TO DEVELOP A NATIONAL ENVIRONMENTAL MONITORING PROGRAM, AND TO CONDUCT ANNUAL WORKSHOPS ON ENVIRONMENTAL MONITORING.

   o WHAT IS YOUR OPINION ABOUT THE NEED FOR A NATIONAL ENVIRONMENTAL MONITORING PROGRAM AS DESCRIBED BY MR. LYON?

   o DO YOU HAVE ANY ADDITIONAL SUGGESTIONS REGARDING HOW A NATIONAL PROGRAM COULD BE IMPLEMENTED?

4. DO YOU HAVE ANY OTHER SUGGESTIONS THAT YOU WOULD LIKE TO MAKE THAT WOULD LEAD TO IMPROVEMENTS IN ENVIRONMENTAL MONITORING?

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Dr. James J. Reisa
Responses to Questions
Re: Testimony of 5/19/83

Mr. SCHEUER. The CEQ report provided thirteen specific recommendations for improvement in environmental monitoring, over half of them relating to coordination issues. Do you believe that the recommendations are as valid now as when the report was released?

Dr. REISA. Yes I do, Mr. Chairman, but only in regard to the needs and goals they address, not the recommended mechanisms. As I mentioned in my statement, the Task Force had to operate under the constraint of limiting its recommendations to actions requiring no legislative or budgetary initiatives, so those kinds of options never received much consideration. Except for two of the 13 recommendations -- the ones dealing with quality assurance and acid rain studies -- the federal government has not yet responded in any significant way to the Task Force's report.

Changes that have taken place in some federal programs and agencies since 1980 might alter what institutional mechanisms would be most advisable today, but the problems and needs that led to the recommendations all remain. In fact, most of the needs are even greater today. The severe budget reductions of the last two years have eliminated some key programs and weakened others. Further, the environmental policies of the present Administration, in seeking to reduce regulatory burdens on the private sector, have generally had the effect of reducing the margins of safety that are factored into most government regulations. This of course increases the risks to public health and the environment at a time when the information base that would be needed to take such actions wisely is being decimated. Regulatory safety margins are nothing more than a way of dealing with uncertainty, and reducing "regulatory burdens" either requires better information or invites greater risks. Many view the present Administration's budget cuts and lack of initiatives in the environmental data and monitoring area as strikingly inconsistent with its avowed environmental goals.

Mr. SCHEUER. What, in your opinion, are the most important recommendations?

Dr. REISA. Having witnessed the Task Force's early deliberations, and having discussed its final recommendations with other participants, I would have to say that they are all important, and that every one of the recommendations, if implemented effectively, would cerainly produce benefits far exceeding their costs.

In one sense, though, I think that the last recommendation of the Task Force -- the one dealing with the budget process -- is the most important because it potentially affects all the others. As I mentioned in my prepared statement, the career staff of most of the programs already recognize the needs, and have both the expertise and the desire to bring about the necessary improvements one way or another. What seems to impede such improvements most often is the unfortunate experience and fear that without new legislation or strong, high-level support, initiatives to improve inter-program coordination are strongly discouraged by the existing budget process.

Mr. SCHEUER. The CEQ report states that "CEQ will work with appropriate individual agencies to implement the recommendations by developing suitable implementation plans." Are you aware of any progress that CEQ has made in working with the agencies to implement the recommendations?

Dr. REISA. I have heard that staff-level efforts in late 1980 and early 1981 produced several draft interagency agreements and executive orders, but these efforts apparently ceased when CEQ's entire professional staff was fired in 1981. There may be some recent or undisclosed progress of which I am unaware, since I am no longer in the government. However, except for CEQ's interagency liaison work on acid rain, neither I nor any of the former Task Force participants I contacted are aware of any significant effort or progress by CEQ in this area over the past two years.

Mr. SCHEUER. Do you believe that CEQ is now able to carry out with the states the implementation of the recommendations, in view of CEQ's current staffing and funding levels?

Dr. REISA. Not a chance, Mr. Chairman. CEQ's reduced budget is too small for any meaningful initiatives, of course, but I fear that the Council's effectiveness probably has ended regardless of the size of its staff or budget.

For eleven years, under three Presidents, CEQ carried out its mission with a professional staff that was hired without regard to partisan politics. I know that to be true, because I had the privilege of serving on that staff during the Nixon, Ford, and Carter Administrations from 1974 to 1978. I believe that few domestic programs in the history of government service managed to do as much with as little as CEQ did from 1970 until 1981, but I am afraid that the Council's tradition of effective service has ended and will not be resumed. In 1981, the Reagan Administration took the unprecendented action of firing every CEQ staff member who had served during the Carter Administration, without regard to professional competence or past performance, in spite of the fact that some of them had served since the Nixon era, and some had more than 20 years of career government service. Only one present CEQ staff member has any significant scientific or technical background. It has been alleged that most of the present staff were hired on the basis of past political service or connections. It is difficult to see how any new Administration -- Democratic or Republican -- would or could return the Council to its former non-partisan professional tradition.

Mr. SCHEUER. You have heard Mr. Walter Lyon explain what he would like to see in a national environmental monitoring program. You have also heard Mr. Lyon recommend establishing a commission to develop a national environmental monitoring program, and to conduct annual workshops on environmental monitoring. What is your opinion about the need for a national environmental monitoring program as described by Mr. Lyon?

Dr. REISA. Before this hearing opened, Mr. Lyon remarked to a few of us that his recommendation was intended to pertain more to the overall purposes of such a program than any specific institutional mechanisms by which it might be established. Many factors must be considered in designing such mechanisms -- the overall goals, existing program responsibilities, agency missions, new technology, available resources, competing priorities, politics, and human nature. I believe that the need for actions such as those described by Mr. Lyon and the Task Force are clearly established. The task ahead is to figure out how best to achieve them, and to go ahead and do it. The Conservation Foundation recently undertook the type of substantial analysis needed to evaluate such institutional mechanisms in its New Environmental Policy Project. I hope that this Subcommittee, possibly in collaboration with others, also intends to undertake such analysis. Since I have not done so, I would not presume to recommend specific institutional mechanisms.

Mr. SCHEUER. Do you have any additional suggestions regarding how a national program could be implemented?

Dr. REISA. Perhaps a few general guidelines or performance criteria would be useful. First, I would suggest that such a program can be implemented without additional resources or new agencies. I believe most Task Force members would agree that on a government-wide basis, the present resources are certainly adequate if applied more effectively. Second, I would hope that the views of technical staff and career managers, as contained in the Task Force's report, would be given substantial weight. After all, a great deal of valuable experience is represented in those views. Third, and perhaps most important, I believe that any mechanisms chosen to implement a national program will need to anticipate the unavoidable tensions between pre-existing statutory responsibilities of the various programs on the one hand, and the coordinating mandate that would be given to any national program on the other hand.

Mr. SCHEUER. Do you have any other suggestions that you would like to make that would lead to improvements in environmental monitoring?

Dr. REISA. I would simply like to offer the observation that the record compiled over the past few years by this Subcommittee and others, as well as by many august reviewing bodies and the Task Force, is rich and compelling. A government-wide reconfiguration of environmental monitoring programs is clearly needed, and the Executive Branch has failed for a variety of reasons to produce it. These factors would seem to argue strongly for new legislation.

Question #1

The National Research Council/National Academy of Sciences 1977 Report made a number of recommendations to improve EPA's monitoring.

a. What are you doing to implement the recommendations of the study?

Answer

The Agency has taken a number of actions following the recommendations of the NCR/NAS report. In all programs, at least some actions have been taken or are underway to improve the scientific reliability of our monitoring, integrate data bases, and coordinate with other Federal agencies and States. The Agency is taking steps to consolidate some ADP functions to improve planning, effectiveness, and efficiency. Further, all quality assurance activities are coordinated through the Agency's mandatory Q.A. program.

However, because programs have different data needs, diverse types of problems occur in different media, and the legislative mandates differ among programs, a clear way of identifying the actions taken by EPA is on a program-by-program basis. Also, some of the recommendations of the report were medium specific.

The following discusses actions that programs have taken following the NRC/NAS report.

Office of Air, Noise and Radiation

In June 1977, the EPA issued the report, "Air Monitoring Strategy for State Implementation Plans." This report critically reviewed and evaluated existing air monitoring activities and recommended air monitoring strategies which would correct identified problems, improve overall monitoring operations, and adequately meet projected air monitoring goals. The report was prepared by the Standing Air Monitoring Work Group (SAMWG) whose members consisted of representatives of State and local air pollution control agencies and EPA program and Regional Offices. The recommendations included in the SAMWG report paralleled many of the recommendations made by the National Research Council/ National Academy of Sciences 1977 report concerning monitoring network operation.

A major SAMWG recommendation called for the revision of the 1971 Federal regulations covering ambient air monitoring. In response, the EPA in May 1979 promulgated air monitoring and reporting regulations (40 CFR Part 58) which corrected most of the major shortcomings of the existing air monitoring programs and responded to requirements of Sections 110 and 319 of the Clean Air Act as amended in 1977.

Briefly, the major elements of the revised regulations are the following:

1. Provides for fixed and movable monitoring sites.
2. Establishes uniform instrument siting criteria.
3. Requires a quality assurance program.
4. Imposes an annual review of a State's ambient air monitoring program.
5. Requires daily public reporting of an air quality index.
6. Provides for the periodic reporting of air quality data and quality assurance information.

Formal milestones were established for carrying out the provisions of the 1979 monitoring regulations. According to the regulations, each State must establish a network of monitoring stations to monitor pollutants for which National Ambient Air Quality Standards (NAAQS) have been established. Two types of permanent stations are specified in the regulations, State and Local Air Monitoring Stations (SLAMS) and National Air Monitoring Stations (NAMS). SLAMS consist of a carefully planned network of fixed monitoring stations whose size and distribution is largely determined by the needs of State and local air pollution control agencies to meet their respective SIP requirements. These stations are the backbone of the ambient monitoring program relative to State Implementation Plan (SIP) activities. The NAMS are a subset of the SLAMS network with emphasis being given to urban and multi-source areas. In effect, they are the key SLAMS with emphasis on areas of maximum concentration and high population density.

The SLAMS, which were designed to meet the overall monitoring requirements of State Implementation Plan activities, were required to meet all provisions of the regulations by January 1, 1983. The NAMS, a subset of the SLAMS, were to provide a national monitoring network as required by Section 319 of the Clean Air Act. The NAMS deadline for meeting all provisions of the monitoring regulations was January 1, 1981.

Of a total of 4957 planned SLAMS monitors, 4829 or 97 percent are in operation as of July 1, 1983. This number is about the maximum expected since monitoring station shutdowns occur because leases are lost, urban renewal projects are initiated, and ambient air monitoring priorities change. Therefore, using 4829 operating monitors as a practical base, 4755 or 98 percent of the operating monitors are meeting all requirements of the regulations. Most of the remaining two percent noncomplying operating monitors represent one local agency. Their air quality monitors should meet the monitoring criteria with some small changes in siting and the submittal of an approvable quality control plan.

Of the 1368 monitors in the planned NAMS network, 1351 or 99 percent are in operation, with 1321 or 98 percent meeting all requirements of the regulations. The remaining monitors, which are mostly lead monitors, should be in compliance shortly.

The National Academy of Science (NAS) also made recommendations for "Obtaining Better Measurements". The following EPA programs have been implemented in this area. State and local agencies were required as part of the monitoring regulations to develop and maintain a quality assurance program that entails quality control and quality assessment activities. Precision and accuracy (P&A) data are now available on EPA's National Aeromatic Data Bank (NADB), along with the associated air quality data.

Another important effort to improve data quality was the development of statistical methods to screen ambient air quality data to detect gross outliers and other data anomalies due to keypunch, transcription and gross measurement errors. The EPA guideline, Screening Procedures for Ambient Air Quality Data, was published in 1978, and the automated procedures are utilized on the Air Quality Data Handling Systems used by 27 State Agencies, and the National Air Data Bank (NADB).

EPA promulgated in February 1975, a regulation covering "Ambient Air Monitoring Reference and Equivalent Methods" (40 CFR Part 53). The regulation established reference methods and testing and certifying procedures that document the equivalency of other monitors and measurement techniques to the reference methods. In February 1980, all monitors had to adhere to these regulations.

Another area where recommendations were made by the NAS was in "Data Analysis and Dissemination". Activities in this area include major studies that have been made to improve EPA's utilization of the ambient air quality data available in the NADB. In February 1981, the U.S. Environmental Protection Agency Inter-Agency Task Force Report on Air Quality Indicators was published. This Task Force was established to recommend standardized air quality indicators and statistical methodologies for presenting air quality status and trends in national publications. It issued a series of recommendations dealing with the creation of air quality trends data bases, the statistical analysis of the data, the interpretation of the data and data presentation. These recommendations have been implemented in EPA's annual National Air Quality and Emissions Trends Report.

In addition to ambient air quality trends analyses, the design of experiments and the analysis of variance have also been employed to better understand air quality siting considerations. Numerous statistical methodologies have also been employed, such as intervention analysis, nonparametric procedures, curve fitting, etc. to better understand and interpret air quality monitoring data.

An application of good statistical practice for example, was the change in the form of the ozone air quality standard from deterministic to statistical. This form of the standard has been widely accepted by all parties in the air pollution control community. Unlike the previous ozone standard, the statistical standard takes incomplete sampling into account and, secondly, incorporates data for more than one year. The statistical form of the ozone standard has established a precedent for the other air quality standards which are presently undergoing review.

In the ongoing NAAQS review process, extensive air quality data bases are utilized to determine the impact of alternative air quality standards. As a case in point, in the review of the carbon monoxide standard, over 9,000,000 hourly CO values were processed to examine the impact of single versus multiple exceedance forms of possible NAAQS(s).

A work group on the "Utilization of Precision and Accuracy Data" has been formed to determine how the precision and accuracy (P&A) data that are associated with the reported air quality data, should be utilized to improve the regulatory decision-making process. The work group produced a report which addressed many issues regarding the utilization of these data. Some of the issues being addressed are attainable P&A, required P&A for attainment determinations, required P&A for trends assessment, etc. This report is currently undergoing internal EPA review.

Office of Water

In response to the major recommendations made by the NRC, the Office of Water has done the following:

1. To improve the statistical reliability of data collected for national assessments, we have designed and implemented a national survey of the Nation's waters called the Aquatic Life Survey. This statistical survey is a process for developing statistically valid unbiased estimates of biological conditions. The survey is now completed and the results are currently being reviewed by EPA management. We have also developed a River Reach File which can be used as a sampling frame for statistical analyses.

2. OW routinely uses the concept of prototype studies developed in conjunction with other Agencies/States, e.g.,

   - Working with the States, EPA conducts site specific criteria studies;

   - Working with the U.S. Fish and wildlife Service, EPA has designed and implemented an Aquatic Life Survey which is a prototype for improving national assessments; and

- Working with some States EPA has designed and conducted prototype biomonitoring studies for the purpose of testing new biomonitoring toxicity testing techniques.

3. OW has been continually improving and integrating its data systems.

   - We have developed the River Reach File which is already serving as an integrator of various State and Federal monitoring efforts.

   - We are also improving STORET, including QC controls, integrating data files, and making the system more responsive and accountable.

4. OW has a lab certification program for drinking water established by Safe Drinking Water Act.

   Within the Agency's mandatory QA program, OW has worked closely with ORD, Regions, and other offices to help develop a coordinated approach, including practical guidance for all data collectors to integrate QA planning into their routine operations.

5. The EPA Regional Offices have collected over 400 samples nationally to establish a baseline for the 129 priority pollutants. Also, EPA is reviewing existing data (GC tape scans) for the 129 priority pollutants.

6. OW has taken steps to improve coordination with other Federal monitoring agencies. We continue to coordinate well with the U.S.G.S. and meet with them periodically as part of an EPA-USGS Coordinating committee; we coordinated very closely with the U.S. Fish and Wildlife Service in the design and implementation of the Aquatic Life Survey. Finally,, we have developed a River Reach File which is already serving as an integrator of the various Federal and State monitoring efforts.

   For those activities which fall outside the perview of Federal monitoring, EPA chairs a Standing Work Group on Water Monitoring and Wasteload Allocations. Membership of this group includes representatives from the States, the Regulated Community, Academia and Environmental Groups. The Group meets regularly to discuss water monitoring and wasteload allocation issues.

Office of Pesticides and Toxic Substances

General Comments:

OTS has applied scientific principles to the design, operation and evaluation of its monitoring programs as recommended by the NRC. In general, OTS

- has a strong Quality Assurance/Quality Control (QA/QC) program which controls and quantifies all potential sources of error including sampling, specimen handling, laboratory measurements and calculations, and data processing. Each OTS Program has a QA Plan and undergoes scheduled systems and performance audits; and
- has a branch whose major responsibility is the design and analyses of OTS studies. This branch is headed by a statistician, has a staff of statisticians and operations research analysts and has a major contract which provides additional support from professional statisticians.
  - This branch uses statistical sampling theory or experimental design theory in the design of OTS field studies. This approach results in studies with data that are demonstrably representative of the population under study and precise enough to meet the objectives or goals of the study. In addition, the branch uses mathematical techniques which optimally allocate the sampling effort.
  - This same branch then analyzes the data properly, taking into account the sampling design which was utilized.

Specific Comments:

EPA has conducted an annual national survey of human adipose tissue over the last ten years. As recommended by the NRC, these tissue specimens have been analyzed for the presence and quantity of selected pesticides and toxics and these annual baseline levels have been regularly reported.

OTS has recently set up an archiving system so that retrospective analyses of other chemicals can be done as the NRC recommended. Just this year, OTS funded a human monitoring initiative to conduct broad scan analyses of archived tissue to identify and quantify the toxics that may be present. The VA has called on OTS to look for TCDD in our archived samples as part of their Agent Orange Study.

In line with another NRC recommendation, OTS has recently analyzed the data from the human adipose network to measure the progress of one of its environmental programs. PCB trends in adipose tissue have been analyzed and a report released showing a dramatic drop in the percentage of the U.S. population with higher PCB levels since PCB regulation was implemented. OTS also found similar trends for some of the pesticides.

NRC's 1977 report stated that adipose tissue had been anlayzed only up to 1973 and results last published in 1974. OTS took responsibility for this network in 1979 and beginning in 1980 OTS developed data entry and processing systems which eliminated these backlogs and tracking systems to identify laboratory backlogs. As a result, OTS is currently analyzing 1981 and 1983 specimens and has produced data analysis reports up through 1981.

In line with NRC's recommendation to publish clear guidelines for the laymen collecting specimens for monitoring studies, OTS has published a guidance document for the protocols for schools to use in complying with the Asbestos-in-Schools Identification and Notification Rule. OTS also funds a toll free number for schools to find out answers to technical questions involving this rule.

Regarding NRC's recommendation for national programs of interlaboratory comparisons, OTS has conducted several interlaboratory studies involving the analysis of bulk materials for asbestos and has produced an Abestos Atlas which helps the analyst identify asbestos through the microscope.

Question #1b

b. How are you bringing scientific and technical leadership into monitoring programs?

Answer

A finding of the 1977 NRC/NAS study was "that along with significant gaps in environmental monitoring there is a proliferation of uncoordinated, inefficient, and inflexible monitoring programs that produce data of poor or unknown quality." Based on this finding, the study concluded that "environmental sciences in EPA lack leadership in positions that could influence monitoring." The study recommended that "within the EPA Administrator's Office, an Office of Science be established to exert scientific leadership in EPA, to aid its programs by better integration of scientific principles, and to improve data collection by more scientific influence and direction."

In the absence of the establishment of an Office of Science it was suggested that "other means should be found to assure that scientific principles are applied to the design, operation, and evaluation of the monitoring programs, and also "definition of monitoring objectives and resolution of primary questions of monitoring network design, data management, quality assurance, and cost-effectiveness be the concerns of EPA's central office."

In 1979 the Administrator delegated authority to the Assistant Administrator for Research and Development to implement a mandatory quality assurance program over all the Agency's environmental data generating measurement systems. The mandatory quality assurance program which has been organizationally identified as the Quality Assurance Managment Staff (QAMS) requires each monitoring system to identify the type of data being generated, the users of the data and documentation of the data quality. The full resources of the scientific personnel within ORD are available to backup the QAMS operation. With full Agency and much private sector participation ORD is developing a management plan, and guidelines and procedures which requires identifications of the types of data being generated and standardizes procedures for evaluating data quality. As an example of quality assurance activities, until 1979 the quality of data from the NPDES self-monitoring discharge monitoring reports (DMR) was largely unknown. In 1979 a jointly planned effort between the Office of Water Enforcement and the ORD quality assurance program was established to evaluate and document the quality of the DMR data. This has been formalized as the DMR-QA program. Annually, EPA Regional and Research Laboratories together with State and local enforcement laboratories participate together with the major discharger laboratories in an analytical performance evaluation by analyzing performance evaluation samples containing 26 critical pollutant categories.

Currently from 100-300 Federal, State, and local laboratories and about 6000 major discharger laboratories participate in the DMR-QA program. Other media examples of how EPA's expert scientific leadership has been factored into the monitoring programs through quality assurance programs for monitoring systems authorized by the Clean Air Act are the State and Local Air Monitoring System (SLAMS), and the National Air Monitoring System (NAMS), and the monitoring required under the Resource Conservation and Recovery Act (RCRA).

Playing a significant, but less direct role in assuring the broadest scientific base to EPA's monitoring efforts, is the Agency policy for peer review of Agency research and applied science programs and reviews by the Administrator's Science Advisory Board. These groups serve in advisory capacities to the Administrator and other Agency leaders in many areas requiring scientific input including monitoring and quality assurance.

Also, many Agency professionals who are at the middle and senior levels of management actively participate in scientific and engineering professional societies. Through these activities state-of-the-art scientific principles and discoveries which can be adapted to monitoring application gain early exposure and consideration by Agency officials who are responsible for planning and implementation of environmental monitoring programs.

In addition, program offices have been working to improve the scientific and technical soundness of their monitoring. An example is that OTS has a branch made up of statisticians and/or analysts whose major responsibility is the design and analysis of OTS studies. This branch is also responsible for QA in OTS and has a working QA program. OTS' QA program has been singled out by the Administrator as being one that has been a leader in incorporating sampling design into EPA's QA program. Because of its unique expertise in EPA, this branch has been asked by other offices in EPA to design some of their field efforts. This branch has also worked with the Agency's Statistical Policy Staff to develop a training course in sampling design which is being offered around the Agency.

Question #1c

c. What are you doing to unify your monitoring programs and eliminate fragmentation?

Answer

EPA has taken a number of actions since the issuance of the NAS report to improve monitoring in the Agency.

- We revised the Agency's air monitoring network for conventional pollutants and air monitoring regulations as a result of work by a Standing Air Monitoring Work Group (SAMWG) of EPA, State, and local officials.
- We implemented the Basic Water Monitoring Program guidance. The work group developing this guidance was composed of EPA and State officials. Officials from other Federal Agencies, industry, and environmental groups have been added to the work group. The group is currently working to further improve that initial guidance.
- We established a Select Work Group on Monitoring that brought together technical experts to study monitoring problems and took action to correct a number of them. In addition, the EPA established a Deputy Assistant Administrator Committee on Monitoring and Information Management.
- We are implementing an Agency quality assurance policy and taking steps to ensure that adequate quality assurance procedures are in place and followed in collection of environmental data.
- We conducted an evaluation of EPA's source monitoring activities and requirements.
- We set up an Information Clearinghouse for EPA environmental data bases and mathematical models.
- We established a review panel of technical representatives from EPA programs to review plans for and purchase of laboratory equipment.
- We created a group within the Agency - the Integrated Environmental Management Project - to integrate EPA's approach to controlling toxics problems.
- We have had our Regional Offices, on a pilot basis, develop Environmental Management Reports (EMRs) that analyze existing environmental information and present a Regional baseline of environmental status and trends, identify the Region's most significant current and emerging environmental problems, and contain Regional recommendations on the Headquarters actions needed to enable them to address environmental problems more effectively.

Despite these numerous activities, the Administrator is concerned that some major monitoring problems remain, particularly with respect to Agencywide coordination and oversight of monitoring activities and our monitoring for toxics. His concern is centered on the fact that good monitoring for environmental information is critical to all of the Agency's responsibilities and will be increasingly important as we delegate program operations to State and local governments.

To ensure that the Agency addresses its monitoring problems, the Agency is in the process of establishing a task force chaired by the Office of Policy and Resource Management (OPRM) to examine and make recommendations on the Agency's monitoring programs.

Question #2

At the 1977 "Environmental Monitoring" Hearings, EPA's George Morgan said: "One of the major functions of the ORD (Office of Research and Development) is to develop a centralized quality assurance program for the Agency. The requirement for a centralized quality assurance program is now generally accepted and recognized throughout the Agency, and we are making progress toward its implementation."

On page 9 of your testimony, you mentioned that your Agency has instituted mandatory quality assurance programs for all EPA and State monitoring programs, and that you are developing practical guidance for integrating quality assurance into the design and execution of all monitoring projects.

a. Who is the Director of your Agency's quality assurance program? When was the Director named?

Answer

The Quality Assurance Management Staff (QAMS) is currently headed by Darwin R. Wright. He was named to this post on September 29, 1982.

b. Describe what progress the Agency has made over the past six years in implementing a centralized quality assurance program?

Answer

The Agency established a mandatory quality assurance (QA) program in May 1979. It requires participation in a centralized QA program by all organizations generating environmental data for use in Agency decisions. The Office of Research and Development (ORD) was delegated responsibility for developing the program and directing its implementation. A Quality Assurance Management Staff (QAMS) was established to carry out this responsibility. QAMS has developed guidance which requires the preparation of a QA plan to document the quality of data, prior to initiation of environmental measurements for both intramural and extramural projects. Audits are conducted to evaluate the progress in implementing QA across the Agency.

c. What is the current status of the program?

Answer

QA plans are now required for all Agency programs and projects, intramural and extramural, that involve the collection of environmental data. Some recent or upcoming specific activities include:

- Expanding the Quality Assurance Management Staff within ORD to include a senior level manager as Director;
- Training QA officers in all program offices, Regional Offices, and laboratories;
- Conducting audits of QA implementation based on the data collected and initiate follow-up for corrective action;
- Conducting audits of analytical performance;
- Developing protocols for conducting data quality audits;
- Completing procedures for improving the management, budget, and operation of QA to ensure that all data are of known and acceptable quality; and
- Utilizing the Agency's accountability system to implement QA.

d. Specify the results of the program, both in terms of directives to monitoring administrators and of the quality of resulting data.

Answer

The current program has resulted in the development and implementation of QA programs by all Agency offices which prepare and/or use data from environmentally related measurements. All offices have quality assurance officers and require QA project plans for all in-house and extramural projects.

The quality of data resulting from the implementation of each office's QA program has not been evaluated at this time. However, the QA audits in FY'84 will be focused on this issue.

Question #3

We seem to be constantly surprised by new problems such as Love Canal, Dioxin, PCB and so on.

a. What kind of monitoring system can we set up that will anticipate and possibly prevent these problems?

Answer

Anticipatory monitoring systems seek to ascertain a deviation from benign background. There are, broadly speaking, a limited number of bases for such systems. One may seek to apply the most sensitive state-of-the-art analytical chemical technology to search for "unknowns" in the environment. One may observe the dynamics of the local environment to ascertain unexpected populations. Such chemical or biological systems would detect deviations in time to ascertain their origin and to take effective control action. Another approach is to subject potential contaminants to laboratory tests, hoping thereby to ascertain their origin to take effective control action. Another approach is to subject potential contaminants to laboratory tests, hoping thereby to ascertain both predictions of their behavior in the envirnment as well as the consequence of their introduction into the environment. Successful prediction here depends upon an accurate environmental model and the ability to make the requisite measurements to operate the model. A variation on this theme is the biological monitorig of wastewater treatment processes currently being researched at EPA to detect unexpected conditions.

EPA has developed and field tested a new monitoring methodology designed to generate data on human exposures to a large number of pollutants. This research should allow us to focus resources on the problems before they become serious threats to health. This approach has been successfully field tested on atmospheric carcinogens and mutagens in the Total Exposure Assessment Methodology (TEAM) Studies.

b. Is enough monitoring and research being done to anticipate and prevent problems?

Answer

Currently we do not understand the basic biochemical toxicological response mechanisms sufficiently to predict or offset the consequences attending exposure to low level contamination. It is difficult with the current monitoring methods to predict the environmental fate and effect on the molecular scale let alone on the macro scale. EPA needs to explore more fully analytical probes, to penetrate hostile matrices, that are simple and rugged for routine use to detect ultra small concentration changes. This is needed to learn how to utilize the resident biota as monitoring tools. Often one cannot monitor concentrations of chemicals at levels which are known to be toxic.

The new TEAM study methodology offers promise for conducting a broadscale screening program to assess human exposures to 15-20 toxic, mutagenic, or carcinogenic compounds for an entire urban area. It is felt that anticipatory human exposure assessment is proving to be a promising field for future research, and future field studies will use this new methodology.

c. What is your Agency doing in this area? What are you finding?

Answer

We have explored the use of several species to monitor contamination such as bivalves and tree rings. While these systems integrate exposure to metals, they have not proved useful anticipatory tools. We anticipate investigating other species such as bees and earthworms as monitoring tools. An environmental speciman bank has been established to serve as a reference point for subsequent comparison of stress. We have begun to study metallothionene and glutathione as monitoring tools. These substances respond to contaminants stress at the cellular level and may provide the earliest pretoxic response. We are beginning to understand the mechanism of action for simultaneous pesticide/metal stress. New or improved monitoring techniques are being evaluated such as surrogate indicator systems, biomonitoring and sensitive screening techniques.

It is prudent to restrict the entry of synthetic materials into our Nation's waters. The industrial and municipal discharge monitoring research is being continued. Also hazardous waste disposal areas run off and leachates are being monitored. The overall adequacy of our waste treatment will be evaluated through monitoring of ambient water quality. Waste disposal whether by landfill, destruction, or discharge at sea should be the subject of long term monitoring to assure performance. Better monitoring tools should be actively sought.

Question #4

In late 1981, EPA in conjunction with the U.S. Fish and Wildlife Service initiated an Aquatic Life Survey and mailed about 1,300 questionnairs to State fish and game agency personnel to develop information on the presence of aquatic life in select stream segments to help demonstrate the biological integrity of the Nation's waters. EPA's own assessment of the Aquatic Life Survey pointed out that it did not rely on hard, empirical data for results but rather on the professional judgements of the individuals completing the questionnaires. The assessment also noted that this reliance on professional judgement could result in biased and inaccurate information concerning water quality.

a. Recognizing the serious potential weaknesses that exist in relying on professional judgment for the survey information, how much validity will EPA be able to place on the results of the survey?

Answer

First, there are several points which should be mentioned as a matte~~r of cla~~rification regarding the EPA assessment referred to in the question.

1. The assessment is a staff options paper presenting the pros and cons of a variety of monitoring approaches. In fact, it concluded with a recommendation that the Aquatic Life Survey approach be explored further as the most promising approach for national assessments.

2. In reviewing the Aquatic Life Survey, the assessment makes a distinction between "hard data" and "professional judgment", and points out that the Survey's reliance on professtional judgment (which may be based, in part, on "hard data") has both potential strengths and potential weaknesses. The potential strengths include the fact that professional judgment can aggregate and assimilate a broad range of information which is more holistic and therefore may be closer to reality than a more rigid, narrowly focused "hard data" assessment might be. Our decision to use the "professional judgment" approach has been further supported by the States as part of the EPA/ASIWPCA STEP project in which they have highlighted the need to increase reliance on direct observation and professional judgment as a most valuable but much underutilized resource.

Because the Aquatic Life Survey relies on professional judgment we took extra steps to ensure the collection of the "best" information, possible. These steps were as follows: (a) we spent a considerable amount of time locating the most knowledgeable respondent for each river reach in the survey;

(b) we developed and tested the survey instrument (questionnaire) to ensure that the questions asked were logical and straightforward, and we also included questions that would disclose knowledge of the basis for the information provided; (c) we followed a very strict implementation protocol to ensure that there was no confusion among the respondents; and, (d) we have implemented a similar but independent survey addressed to a different set of knowledgeable respondents to provide a basis for comparison for selected questions. This "concurrent" survey should be complete in the near future.

We have now completed the Aquatic Life Survey and we feel that these preliminary efforts have been fruitful. An assessment of the respondent's experience shows, for example, that they are experienced biologists and knowledgeable of the reaches in the sample. Their average experience in the basin containing the sample reach is nine years and the survey results show that "hard data" was used as the basis for of the professional judgment provided to us by the survey respondents for about three-fourths of the river miles evaluated.

From the results so far, we believe that the results of the survey are indeed valid.

b. If EPA decided to use similar surveys in the future, how will it revise survey methodology to ensure statistically valid, unbiased information?

Answer

The Aquatic Life Survey was designed to produce statistically valid estimates, properly weighted and analyzed to reduce bias. Because the characteristics of this design were carried through the analysis of the information provided, the survey has in fact produced statistically valid unbiased estimates. Therefore, if we were to employ this same design for future surveys, there is no need to modify the survey methodology.

Regarding data validity and respondent bias in future surveys, we will take whatever steps necessary to ensure that the data provided is as accurate as possible. If future surveys should employ a questionnaire similar to that used in the Aquatic Life Survey, we will take steps similar to those discussed above. If the survey should employ actual field data collection, we will exercise appropriate quality control/quality assurance procedures.

Question #5

EPA uses a computerized information system (STORET) for storing and retrieving the water quality data it acquires from the States, the Geological Survey, and local agencies under its network monitoring program. At the present time, STORET's water quality file maintains monitoring results from over 200,000 locations.

a. How has EPA used the vast amount of water quality monitoring data in the STORET system in making decisions concerning water quality conditions in the Nation? Please provide examples.

Answer

The primary uses of the STORET system are by the States and EPA Regions in making local and Statewide analyses of water quality for the purpose of identifying and screening potential problem areas, assessing the nature and causes of water quality problems, setting water quality standards, establishing water quality-based controls, evaluating the results of controls, and reporting status and trends to the public. In addition, EPA and other agencies have occasionally used STORET for broad regional or national studies of water quality. Some examples include:

- A number of States (e.g., Arkansas, Utah, and Montana) have used STORET together with appropriate computerized screening methodologies to help develop priority rankings of water based on water quality levels.
- At least 30 States use STORET routinely to analyze information from their ongoing monitoring stations to help identify water quality problems, and a smaller number use STORET to help analyze intensive survey information concerning pollution causes.
- Many States are using STORET to organize and analyze the data needed to perform site-specific water quality standards revisions, and to perform wasteload allocations and total maximum daily load calculations which are needed to establish NPDES permit limitations.
- Many States routinely use STORET to help prepare their Section 305(b) reports to Congress every two years.
- The Nationwide Urban Runoff Program used STORET as the primary data management system for over one million observations of water quality during runoff events to help develop better statistical estimates of the nature and extent of urban runoff problems.

- The ten EPA Regions used STORET to store and analyze over 400 samples collected to establish a rough baseline of information on the 129 priority pollutants. EPA headquarters was able to use this information in helping develop exposure and risk assessments for these pollutants.
- Two large regional studies--the Great Lakes program and the Chesapeake Bay program--routinely use STORET for the storage and analysis of water quality information to carry out studies required by international treaties and by Congressional mandates.

b. Doesn't the fact that the water quality monitoring data comes from a variety of sources over which EPA has no quality control raise serious questions about its uniformity and usefulness in making decisions about water quality on a national level? Would it not be more appropriate to describe the STORET system as a collection of individual Federal, State and local water quality monitoring data bases rather than a national water quality data base?

Answer

STORET is neither designed nor operated to be a "national water quality data base" in the same sense that Census Bureau computer files, for instance, are a national population data base. STORET is, rather, operated as a computer utility available for Federal and State agencies to store, retrieve, and analyze water quality data. It is more than "a collection of individual data bases", since the data are all available in one common format using consistent data definitions to any qualified user. However, the data (with some notable exceptions) fall far short of being a comprehensive national data base from which national assessments can be routinely made. The exceptions are those sets of data in STORET specifically designed for national assessments, including the NURP data, the U.S. Geological Survey's NASQAN stations, and the Regional priority pollutant samples.

Question #6

Since the GAO report on Water Quality Monitoring in 1981, an EPA inhouse evaluation has raised several questions about the nature and objectives of the Nation's Water Quality Monitoring System. EPA's evaluation found that the Agency has not determined the specific water quality questions a national assessment should answer and that EPA must decide this issue before making any decision concerning a national assessment approach.

° Has EPA made any decision as to the types of water questions it wants answered by the national assessment? If not, when does EPA plan to decide this important issue?

Answer

The EPA in-house evaluation of monitoring states that the Agency needs to decide the questions that should be answered so that the most effective approach is utilized in responding to the questions. The Office of Water has identified a number of questions for which national assessments could be conducted. These questions include:

° What are the extent, severity, and effects of point source discharges on water quality?

° What are the extent, severity, and effects of nonpoint sources on water quality?

° What is the relative effect of point versus nonpoint source impacts?

° What are the impacts on aquatic life and human health from pollution, particularly toxic substances.

° What progress has been made in cleaning up the Nation's waters over the past few years?

° To what extent has the fishable/swimmable goal been attained? What are the circumstances in areas where it has not been attained?

° What are the priority problems that remain to be dealt with?

EPA has taken a three-pronged approach towards providing initial answers to these questions. The first approach is the Aquatic Life Survey. The survey was designed to make estimates concerning the fisheries community nationwide. In addition, the survey results provide information on the effects of point and nonpoint sources of pollution, the relative effects of specific parameters on the fish community, and of the trend in fisheries habitat (including water quality) over the past five years.

The second approach is the use of State reporting, particularly the Section 305(b) reports, and the reports to be developed this summer under the joint leadership of EPA and the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) entitled "States Progress Under the Clean Water Program" (STEP). The STEP project was initiated to develop a system to better assess the progress that has been made in water quality and water programs over the past decade. The draft guidance for the 1984 State Section 305(b) Reports incorporates many of the indicators developed through the STEP project to establish a system by which progress in water quality and programs can be tracked in the future. This guidance also requests information on the progress of the States towards the fishable/swimmable goal set in Section 305(b), information on toxic human health and aquatic life concerns, and other remaining water qualtiy problems.

The third approach is the use of special studies to investigate very specific issues, such as the effects of particular toxic parameters or the water quality improvements that will be made with the implementation of BAT. The nationwide study of dioxin being planned is an example of these special studies.

Question #7

In September 1982, EPA awarded a $200,000 grant to the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) to develop a uniform system for assessing nationwide progress in improving water quality. According to EPA, the main objective of the project is to document the accomplishments under the Clean Water Act in cleaning up the Nation's waters and to package this information in a clear, concise report to the Congress. Present plans are for the project to be completed in October-November 1983.

- Do EPA's actions in awarding a grant to document the accomplishments of the Clean Water Act mean that EPA does not know what the Act has accomplished natiowide over the past decade in cleaning up the Nation's waters. If so, to what extent has the lack of a statistically reliable monitoring program contributed to this program?

Answer

EPA has been able to assess the progress that has been made in water quality over the past decade by using the State Section 305(b) reports. However, the information provided in previous State Section 305(b) reports has been variable from State to State, making precise national level assessments difficult. We have initiated a number of efforts over the past two years to improve the precision of our estimates.

For example, the River Reach File was developed to provide a common framework that can be used when making national assessments. The Aquatic Life Survey combines the River Reach File concept with sound, statistical design and analysis techniques to generate statistically valid estimates of the quality of the Nation's waters and trends in these waters.

EPA awarded the grant to ASIWPCA for the STEP project to (1) involve the States directly in the development of indicators of environmental results in the water program and to (2) improve water quality reporting so that better assessments of national conditions can be made. Although the project will not result in statistically based conclusions, it will provide a summary of water quality from the viewpoint of each State using a consistent format and definitions.

Question #8

Over the years, EPA, the Geological Survey, and the individual States have gathered massive amounts of data on Water Quality. In addition, under section 305(b) of the Clean Water Act, each State provides EPA with biennial reports which describe, among other things, the quality of navigable waters in each State and the extent to which the Clean Water Act has or will eliminate the discharge of pollutants into the waters. Finally, numerous special water quality studies and analyses have been performed by Federal, State, and local agencies.

- From all of this work, can EPA tell us how much the quality of our Nation's waters has improved over the last decade? In other words, to what extent has the quality of water improved as a result of the billion of dollars the public and private sector has invested in water pollution control measures?

Answer

Water quality data gathered from a variety of sources, including special EPA studies, monitoring networks, and the State Section 305(b) reports, show that pollution control measures adopted since the passage of the 1972 Clean Water Act have substantially improved water quality.

Reductions in the loading of pollutants to receiving waters are an effective measure of the success of regulatory pollution control measures. To date, the overwhelming majority of industrial facilities have installed Best Practicable Technology (BPT), which is estimated to have significantly reduced discharges of six key pollutants: biochemical oxygen demand (BOD) by 69%; suspended solids by 80%; oil and grease by 71%; dissolved solids by 52%; phosphate by 74%; and heavy metals by 75%.

Loading reductions are also occurring with the introduction of secondary treatment at municipal sewage treatment plants. By 1980, municipal plants were removing BOD and suspended solids at levels 65% higher than 1973 levels. These reductions occurred despite rising population and municipal wastewater flows, and are due in part to a significant increase in the number of plants achieving secondary treatment levels, from 40% in 1975 to over 75% in 1980.

The 1982 National Water Quality Inventory Report to Congress, which summarizes what the States have said about water quality in their Section 305(b) reports, is currently in the final stages of EPA review and will be available soon. It indicates that water quality is improving in many States, and that many of these improvements can be attributed to pollution control programs. The States report that a majority of the waters that were assessed in 1982 meet the interim "fishable/swimmable" goal of the Clean Water

Act. Twenty-one of the 35 States providing overall trend information report generally improving water quality trends. Fourteen report generally stable trends; none report overall degrading trends. However, it should also be noted that 29 States report some degrading water quality trends in localized areas.

The States also provide many examples of water quality improvements that can be directly attributed to point and nonpoint source control programs. Thirty-six States cite improvements in their waters as a direct result of the construction of municipal wastewater treatment facilities. Specific information is provided by some States on reductions in pollutant loadings and increases in pollution served by secondary levels of treatment. Twenty States report improved water quality due at least in part to pollution controls implemented by industry. Some States report significant successes in nonpoint sources pollution abatement, although in many cases the impact of nonpoint source control programs can be difficult to quantify. However, it should be noted that certain water quality problems such as localized toxics contamination, widespread and diffuse nonpoint source of pollution, and violations of standards due to municipal and industrial dishcarges, continue to affect many of the Nation's waters.

Perhaps the most revealing measure of the effectiveness of the Nation's water pollution control programs is the large number of specific water quality success stories available both from the State Section 305(b) reports and EPA studies. For example, Rhode Island reports significant improvement in the Blackstone River due to completion of sewage treatment plant projects in Massachusetts and Rhode Island; Alabama reports that construction of 66 new sewage treatment plants has resulted in improved water quality and the elimination of potential health hazards in a number of areas across the State; improved cyanide levels in the Ohio River mainstem are directly attributed to better industrial treatment on the Monongahela River; and Wisconsin reports that efforts to meet BPT discharge limits in the State's 42 pulp and paper mills have resulted in a 90% decrease in BOD and a 75% decrease in suspended solids discharges from these mills over the past seven years. Nationwide, desirable fish species have returned and recreational uses have been restored to many rivers and streams which once were seriously degraded, such as the Neches River in Texas and the Penobscot River in Maine. This is clearly the result of the efforts and expenditures of the public and private sectors over the past ten years to improve the quality of the Nation's waters.

Despite this progress, point and nonpoint sources of pollution, as well as other factors such as natural variation in streamflow and hydrologic modifications, continue to cause violations of water quality standards and are limiting water uses in many areas of the country. For example, thirty States cite localized violations of water standards or impairments of water uses due to toxic substances.

Question #9

Across the United States, over 55,000 chemicals are being manufactured, imported, marketed; yet only a small fraction of these have been tested for their long-term effects on the environment and human health. Little is known about the potential toxicity of most of these chemicals.

- What is EPA doing in the area of monitoring of toxic substances?
- What should be done?
- How much of the EPA Budget is being spent on monitoring toxic substances? What is the minimum amount needed?

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Office of Toxic Substances

OTS conducts the National Human Monitoring Program (NHMP) which was established in 1967 to monitor levels and prevalence of pesticide residues in the general population of the United States and to assess the changes and trends in these levels. The program was initiated by the United States Public Health Service and was transferred in 1970 to the then newly created Environmental Protection Agency (EPA).

The National Adipose Tissue Survey (NHATS) is one of the major ongoing components of NHMP. Specimens of adipose tissue are collected from surgical patients and autopsied cadavers through the cooperation of local pathologists and medical examiners throughout the contiguous United States. The adipose tissue specimens are chemically analyzed for twenty chlorinated hydrocarbon compounds such as PCBs and hexachlorobenzene. In addition, demographic, geographic, and medical information is recorded for each individual sampled.

The primary objectives of the adipose tissue survey are to measure the average concentration of pesticides and other toxic chemicals in the general U.S. population, measure the time trends of these concentrations, and assess the effects of regulatory actions. The adipose tissue survey also provides baseline data that may help in detecting and evaluating health disorders suspected to be due to pesticides or other toxic chemicals.

Efforts are currently underway to improve OTS capability to monitor for a wider range of toxic substances. In FY'83, OTS is performing broad-scan chemical analyses on a set of adipose specimens that will identify the range of compounds that can be monitored using adipose tissue. Additionally, efforts are being made to improve the design of the NHATS in order to provide data useful to EPA Regions as well as State and local governments.

These design improvements will also make it possible to conduct special local area monitoring studies so that the data generated is compatible with, and comparable to, the National Survey data.

The NHATS poses limitations in terms of TSCA and OTS monitoring needs; not all toxic substances accumulate in adipose tissue. To address this problem, OTS is initiating the design and implementation of a complementary network to provide the capability to monitor these "non-lipophilic" compounds.

OTS also participated in the second Health and Nutrition Examination Survey (HANES II) operated by the U.S. Public Health Service through the National Center for Health Statistics. Through this four-year survey, specimens of human urine and blood serum were analyzed for various environmental contaminants throughout the United States.

In addition to these efforts, OTS conducts many "problem oriented" monitoring efforts. Examples of these include:

1. Through specialized air monitoring protocols, EPA continues to assess human exposure to asbestos. Field Studies are conducted to determine the factors that contribute to airborne asbestos levels in schools. The Asbestos-In-Schools program will be continued in future fiscal years.

2. At the request of EPA Region VI, OTS designed a study and analyzed the data to assess the extent of exposure to lead in smelters in Dallas.

3. A sampling program was implemented to determine if polychlorinated dioxins, dibenzo furans, and associated compounds are produced by a waste incineration process in New York.

4. A three city study assessed the levels of various halogenated organic compounds in human media (i.e., blood, breath, urine, etc.).

5. A monitoring effort oriented towards occupational and consumer exposure evaluated groups of chemicals such as glycol ethers and reprocessed solvents in laboratory situations simulating consumer use. This approach avoids the unnecessary exposure of humans to potentially dangerous and toxic fumes.

Priority chemical lists within OTS have been generated on the basis of positive toxicological tests results relating the chemicals to adverse health effects (e.g. carcinogenicity). Little or no information is available through monitoring studies to determine if and to what extent people in the population are being exposed to these and, more importantly, untested compounds. Much more work is needed to develop the capability to assign priorities for chemical testing. Further investigation should be based on documented evidence of exposures. Monitoring studies need to be expanded to allow for future need for assessment of human exposure to toxic substances.

The fundamental purpose of toxic substance monitoring is to determine which chemicals we should be regulating and to what extent. To do this we must ascertain and quantify the exposures to chemicals that have adverse health and environmental effects. Determination of these exposure/effect relationships is necessary in order to:

1. identify those chemicals that are related to impaired health; and

2. derive, insofar as possible, actual exposure/effect (i.e., dose/response) relationships.

In addition, monitoring activities must also:

3. maintain surveillance over the environmental concentrations of known highly toxic chemicals, both to anticipate problems and to evaluate the efficacy of previous control actions;

4. develop data to support rule making; and

5. ensure compliance with EPA control actions.

For FY'84, OTS has developed proposals for monitoring studies that include 575k for the National Human Monitoring Program and $1.3 million for five chemical-specific exposure studies for such compounds as formaldehyde and MDA. In FY'83, OTS is expending approximately one fourth of this total on monitoring activities.

In recent years, OTS has acquired considerable expertise in the areas of study design, data analysis, and quality assurance and has provided technical assistance to other program offices in these areas. TSCA deals with occupational, consumer, environmental and indoor exposures whereas the other program offices do not.

Office of Pesticide Programs

During FY 1983, the Office of Pesticide Programs (OPP) is supporting the National Pesticide Hazard Assessment Program (NPHAP) at a level of 1.4 FTE's and $1,866,000 in extramural funds (probably about $1.5K is devoted to actual monitoring). This program, consisting of cooperative agreements with eight universities, supports reporting on pesticide use related to farm worker populations, protocols for monitoring, field and epidemiologic studies, including Youth in Agriculture, training for medical personnel, reports on application technology, and emergency response. The NPHAP includes the National Pesticide Telecommunications Network which provides information to physicians for treating and diagnosing pesticide poisoning, and the National Pesticide Information Clearinghouse which gathers information regarding pesticides for distribution to the public.

During FY 1983, OPP is also participating with the HHS National Center for Health Statistics in the Health and Nutrition Examination Survey for Hispanics (Hispanic HANES) by analyzing samples of blood serum and urine for selected pesticides. In addition, OPP has agreed to cooperate with the Office of Toxic Substances in an expanded chemical analysis of selected composite specimens of human adipose tissue. OPP also maintains the Toxicant Analysis Center at Bay St. Louis, Mississippi, to provide analytical support to HANES Hispanic survey, emergency response support, and some dioxin monitoring support. Currently this facility is supported with 20 FTE's and $362,000 in extramural resources.

OPP generally monitors, or requires registrants to monitor, in areas where we believe problems could arise. For instance, we have several projects to monitor farmworker exposure to pesticides because they are an obviously highly exposed group. Another area of concern is the movement of pesticides residues into ground water used for drinking water. Although OPP requires registrants to submit data on the potential for ground water contamination of a pesticide, and intensively reviews the use pattern of each pesticide with a potential to leach to ground water, there remains some uncertainty in the size of the ground water problem from past use of certain highly toxic pesticides. OPP has developed an approach to ground water protection, which was recently presented to the Scientific Advisory Panel, and is cooperating with numerous States actively engaged in ground water monitoring. OPP is also sponsoring research on movement of pesticides in major aquifer areas such as the Dougherty Plains area of the Southern United States. The key to the control of ground water contamination of pesticides, however, is prevention, not monitoring after the problems occur. OPP has therefore established ground water monitoring requirements in its data requirements for experimental use permits for new pesticides in order to better predict potential ground water problems before they occur, and we are putting more emphasis on monitoring, a Pesticide Program priority.

Question #10

Would you please describe what is meant by body burden monitoring? What does it provide? What has your Agency done in the past in this area? What are you doing now? What do you plan to do in the future?

Answer

BODY BURDEN MONITORING

The body burden of a chemical is the level of a given chemical or degradation product of a chemical which can be detected in any human biological media. Body burden is a reflection of exposures to environmental components such as food, air, and water contaminations, as well as from the administration of pharmaceuticals.

The location of chemical residues in the human body is dependent on the chemical properties of a given substance. For example, water soluble chemical residues would most likely be detected in blood and urine. Highly volatile compounds such as benzene and chloroform are easily detected in exhaled breath. Indications of exposure to non-water soluble substances would generally appear in fatty tissue (i.e., adipose) and certain organs; other xenobiotic residues like heavy metals appear in nails, hair, and kidney cortex.

Body burden monitoring is the measurement of the levels of toxic substances or their metabolities in human biological specimens (organs, tissues, blood, secreta, and excreta) for the purpose of obtaining a chemical index of exposure to the compounds. The chemical index of exposure is a quantitative measure that represents the amount of the substance absorbed and retained (accumulated) either in the body, specific biological media or body compartments.

Biological monitoring is useful for several reasons. First and foremost, it provides direct evidence of exposure and absorption of a xenobiotic. It thus alerts one to the possibility of a human health hazard. The data obtained by biological monitoring can be correlated with the observed level of pollutants in the environment, as well as correlated with the incidence of human diseases which may be due in part to the presence of the pollutants. These correlations can be used to determine priorities with regard to research relating to human health, and to determine the necessity of regulation of pollution sources. Biological monitoring can point out pollutant problems which are not otherwise noted, such as could occur due to bioaccumulation of pollutants in humans resulting from long term exposure to very low levels of pollutants in the environment.

PAST, PRESENT, AND FUTURE ~~EFFORTS~~

The ongoing National Human Monitoring Program (detailed in the response to question #9) provides "baseline" residue levels of chemicals within the general, civilian population in the United States. These data may and have been used as a standard for evaluating potential public health hazards posed by a chemical "incident" such as an industrial or a commercial spill, accidental contamination of water supply, or other similar situations--essentially risk assessment.

In addition to surveys of national scope, the EPA has operated many special projects. Usually they are designed to answer a specific question or groups of questions about selected chemicals. They may be oriented toward examining human chemical exposure to a chemical of limited geographical use such as pesticides, toward evaluation of human exposure to a specific substance in a designated use situation such as occupational exposure, or toward assessing many chemicals in a human media such as mothers' milk (see #9).

Initiatives for OTS for the upcoming fiscal year have been directed toward the continuation and expansion of successful, past monitoring projects. This includes a review of chemical analytical methods used to detect xenobiotics in human adipose tissue. We expect to be successful in developing state-of-the-art methodologies for the residue measurements of additional TSCA-related substances. Work will be continued in the area of asbestos monitoring, particularly directed toward asbestos in schools. Assessment of human occupational and consumer dosage will be expanded.

Additionally, initiatives will be made toward assessing infant exposure to various chemicals through human milk. Toward this end, OTS developed a nationally-based human milk monitoring study to assess chemical contamination of this biological medium.

The current emphasis in OTS is on the monitoring of human biological media. Although special studies frequently require the monitoring of environmental media (i.e., soils in the Dallas Lead Study), budget limitations require that OTS focus on one type of monitoring to maximize information for the dollars spent. The monitoring of human media allows us to develop information critical to the determination of high priority chemicals based on exposure.

In the past, EPA, through its Offices of Research and Development and Toxic Substances, has developed methods for monitoring volatile organic compounds (particularly chloroform) in blood and urine. It has tested methods for monitoring other pollutants (including metals, pesticides, PCBs, and polyaromatic hydrocarbons) in blood, urine, and hair. Methods for monitoring volatile organic compounds (VOC) in breath and in mother's milk have also been developed. All these methods have been field-tested on small numbers of people in the general population.

A much larger study of 22 toxic air pollutants in the personal air, drinking water and exhaled breath of 400 persons in New Jersey, North Carolina, and North Dakota (the TEAM Study) has recently completed field activities. Data analysis is just beginning.

In ORD, analyses of the data collected in past field studies will continue, developing hypotheses that will be tested in future field studies. Two field projects are in the planning stage; both involve testing methodologies to monitor human exposure, including measurement of body burden as described above.

Question #11

You have heard Mr. Walter Lyon explain what he would like to see in a national environmental monitoring program. You have also heard Mr. Lyon recommend establishing a commission to develop a National Environmental Monitoring Program, and to conduct annual workshops on environmental monitoring.

- What is your opinion about the need for a national environmental monitoring progam as described by Mr. Lyon?
- Do you have any additional suggestions regarding how a national program could be implemented?

Answer

Mr. Lyon made some very good recommendations. However, I believe creating a National Environmental Monitoring Program outside of the existing agencies is not the best approach for solving the problems with monitoring programs. Although we understand Mr. Lyon's concerns, we believe agencies should continue to be responsible for carrying out the monitoring which primarily supports their programs. We believe that a national monitoring program should come about by better and more formal coordination of the various monitoring programs.

The Council on Environmental Quality's report Interagency Task Force on Environmental Data and Monitoring, March 21, 1980, pointed out that environmental monitoring is not an end in itself, but only the means for providing data and analytical information for other functions. Bringing together, under one umbrella, a share of the Federal agencies' existing monitoring resources for the purpose of establishing a National Environmental Monitoring Program could have the adverse effect of diminishing the use that is made of the data.

EPA has been working closely with States on air and water monitoring efforts. Two work groups, the Standing Air Monitoring Work Group (SAMWG) and the Standing Work Group on Water Monitoring and Wasteload Allocations have State and local agencies represented. SAMWG developed a monitoring strategy which was used in establishing the regulations to fulfill the national monitoring required in Section 319 of the Clean Air Act. These regulations have been implemented and are now in the early stage of being reviewed for appropriate modification. The States and local agencies are involved in this early stage of the review.

Although we agree that the need exists for coordinated national monitoring programs, we still believe that such monitoring needs to be directed by the agency responsible for using the information that has been generated. EPA has over the last two years developed mechanisms for making better use of environmental data in its management decisions. However, we believe that there is a need for monitoring programs that yield national assessments that provide for:

- establishing baselines and measuring trends;
- evaluating the progress of national environmental programs in terms of changes in environmental quality;
- determining relationships among sources of pollution;
- assessing pollution effects on humans, animals, and plants, and
- identifying emerging problems.

We agree that better coordination of monitoring is needed within EPA and among EPA and other Federal agencies, State agencies and other organizations conducting monitoring programs. Annual workshops on environmental monitoring would be useful in aiding this coordination and should be pursued. Work groups that meet more frequently could be considered for such topics as network design, analytical methods, and interpretation of data. Also memoranda of understanding should be considered among Federal agencies to more explicitly define the agreements made.

Over the next few weeks and months the new senior management at EPA will be evaluating the monitoring activities and how to better manage EPA's monitoring programs. The Agency is now in the process of establishing a task force chaired by the Office of Policy and Resource Management to examine and make recommendations on EPA's overall monitoring efforts. We will be pleased to share the results of these deliberations with you.

Question 12

Do you have any other suggestions that you would like to make that would lead to improvements in environmental monitoring?

Answer

We believe the ultimate goal of monitoring should be to ensure that environmental data are used in making management decisions--including operations and regulatory support, defining Agency priorities, and establishing policies. The main benefit of using environmental data in making decisions is that better decisions are made because of knowledge of the real world situation, and therefore, better environmental management results.

As EPA's responsibilities change and focus to emphasize oversight of State and local environmental programs, we are going to need monitoring capabilities to provide appropriate guarantees to Congress and the American people that we are continuing to make progress toward solving problems and cleaning up the environment. To do this, management within EPA for coordination and oversight based on environmental results will be necessary; this is a priority of the new management team.

Also analyzing the data for use in making decisions leads to better monitoring because gaps in monitoring data become obvious, inconsistencies in monitoring data become apparent, and the lack of coordination among programs becomes evident.

The EPA Regional Offices have just completed preparation of Environmental Management Reports, reports that use environmental data to document status and trends of environmental problems and include management recommendations. These reports identify problems with monitoring programs and need to be considered. For example, a consistent monitoring concern raised by the Regions is the lack of environmental data on toxic pollutants for which inadequate data exist to assess the magnitude of the problem.

The Office of ~~Program~~ Policy and Resource Management is in the beginning stages of preparing a national environmental assessment, using not only the environmental information prepared by the Regions but data from other Federal agencies and other sources as well. By using environmental data we expect not only to allow for better management decisions but also to identify monitoring problems that can be solved and make the environmental data bases even more useful.

In addition, EPA has begun developing environmental indicators; this effort was described briefly in my testimony on monitoring. We believe that developing environmental indicators on which Federal agencies agree and on whicn State and local agencies agree could aid in unifying the various monitoring programs.

Also, by focusing on environmental results, which will require analyzing and interpreting environmental data, I believe the monitoring will improve and more priority will be given to solving the problems that have been of concern for so long.

U.S. Geological Survey Responses
to Questions Raised Subsequent
to May 19, 1983, Hearings

Question 1.

During a June 1982 hearing before this subcommittee, the United States Geological Survey testified that it had applied statistical procedures to its fixed-station monitoring data and that a comprehensive statistical summary of the status and trends in water quality would be available in published form by the end of 1982.

- Has the Survey completed its statistical summary? If so, what does it tell us about the quality of water in the areas served by the Survey's fixed stations?
- Can you tell us in how many areas overall water quality has improved, deteriorated, or remained the same?

Answer.

A comprehensive statistical summary of data for all quality constituents is now complete. As the name implies, the summary consists of tabularized statistical information based on data collected from the fixed-station networks over a number of years. Several of the more interesting and significant results of the summary were described in our written statement and in the oral testimony before the committee. A more comprehensive interpretive discussion of the statistical results, focusing on possible causes of observed trends in water quality, is now in preparation and is scheduled for publication this fall.

In December 1982, at the request of the President's Council on Environmental Quality, we produced a publication for inclusion in the Council's annual report. Our study (copy attached) focused on national trends in "conventional" measures of water quality, specifically dissolved oxygen and fecal coliform bacteria. We found that relatively few stations (about 70 of the 276 stations studied) showed statistically significant trends in either of these measures over the period 1974 to 1981. But of the stations which did show trend, a large majority (85%) showed changes in the direction of improving quality (i.e., decreases in fecal bacteria and increases in dissolved oxygen).

It is difficult to speak in terms of "overall water quality" because there are so many different components of quality. The statistical summary includes trend results for 38 chemical and biological constituents. It is safe to say that in no geographic area has water quality either improved or deteriorated in all (or even most) of these quality constituents. In terms of the full suite of quality measures, one would have to conclude that water quality has been roughly static over the period of study (1974-1981).

Nevertheless, certain constituents or groups of constituents show clear geographic patterns in the occurrence of trends which may relate to important changes in the sources of substances entering rivers and streams.

Two constituents display particularly interesting geographical patterns in the results of trend tests. First, chromium levels have increased at a number of stations in the northern Midwest, in basins draining steel producing areas and related industries. Second, oxidizable forms of nitrogen (termed Kjeldahl nitrogen) have tended to increase at many stations across the Nation, but especially in certain Western States (namely Montana, Washington, Oregon, and California).

Two other interesting geographical patterns in water-quality trends may be worth mentioning, even though our analysis is incomplete. First, lead levels have declined significantly at a number of stations along both the east and west coasts. The period of study spans the years in the latter 1970's when a sigificant shift occurred to the use of unleaded gasoline. We are now investigating the possible cause-effect relationship using historical data on nationwide gasoline sales provided to us by the Ethyl Corporation.

Second, increases in suspended-sediment loads in rivers have occurred at somewhat greater frequency (more stations) than have decreases in loads. The increases have tended to occur in basins draining important agricultural areas, especially in the lower Mississippi Valley, while the decreases, in some cases at least, appear to result from dam construction and the subsequent trapping of sediment in reservoirs. We are now conducting a basin-by-basin comparison of our data on sediment loads in rivers with the Soil Conservation Service's 1977 nationwide inventory of erosion conditions. We feel that it is important to determine whether the basins identified by the Soil Conservation Service as having chronic erosion problems are showing signs of worsening conditions in terms of soil loss to streams.

A STUDY OF TRENDS IN DISSOLVED OXYGEN AND FECAL COLIFORM BACTERIA AT NASQAN STATIONS

By Richard A. Smith and Richard B. Alexander

ABSTRACT

Most stations in the U.S. Geological Survey's National Stream Quality Accounting Network show no significant trend in either dissolved oxygen concentration or fecal coliform bacteria population for the period October 1974 through October 1981. Of the stations which do show trends, however, most show improved water quality: thirty-one of a total of 276 stations show rising dissolved oxygen concentrations, while only 17 show decreasing concentrations. Decreases in fecal coliform populations have occurred at 21 stations while increases have occurred at only 12 stations.

Approximately half of the stations showing improving trends in dissolved oxygen and fecal coliform bacteria are in the Missouri-Mississippi-Ohio River system. Decreases in dissolved oxygen have occurred at scattered locations in the Western and South-Central States. Rising bacterial populations occur most frequently in the Eastern and Central States

Trends in dissolved oxygen concentration resulting from temperature changes occurring during the study period can be separated from trends caused by chemical or biological processes by analyzing computed values of dissolved oxygen deficit. About half of the observed trends in dissolved oxygen appear to be the result of changes in water temperature.

INTRODUCTION AND METHODS

This report presents results of the Seasonal Kendall trend procedure (Hirsch and others, 1982) applied to measurements of dissolved oxygen (DO) concentration and fecal coliform bacteria populations at stations in the U.S. Geological Survey's National Stream Quality Accounting Network (NASQAN) for the period October 1974 through October 1981. The Seasonal Kendall procedure was designed for analysis of time trends in seasonally varying water-quality data from fixed, regularly-sampled monitoring sites such as those which comprise the NASQAN network. In addition to a test for trend, the statistical procedure includes an estimate of the median rate of change of quality over the sampling period (trend slope) and a method for flow-adjusting the data to correct for effects of changing stream flow on trend in the water-quality record.[1/] Trend is defined here simply as monotonic change with time, occurring either as an abrupt or gradual change in water quality.

[1/] Flow adjustment of fecal coliform bacteria measurements required modification of the Seasonal Kendall procedure to include log transformations of these data (R. M. Hirsch, personal communication, 1982).

A previous report (Smith and others, 1982) describes in detail an application of the Seasonal Kendall procedure to total phosphorus records at NASQAN stations.

RESULTS AND DISCUSSION

Figures 1 and 2 are maps depicting the results of flow-adjusted trend tests applied to NASQAN records for DO and fecal coliform bacteria, respectively. Triangles indicate the location of stations showing statistically significant ($p < 0.05$) trends; the triangles point in the direction of change in flow-adjusted concentration. The size of a triangle (small, medium, large) indicates the steepness of the trend slope or rate of change of quality. Shaded circles indicate the location of stations with no significant trend, either up or down, in the water-quality variable.

Most stations show no significant trend in either DO or fecal coliform bacteria for the period studied. Of the stations which do show trend, however, most show changes in the direction of improving water quality: thirty-one, of a total 276 stations, show rising DO concentrations, while only 17 show decreasing concentrations. Geographically speaking, increases in DO concentration have tended to occur at sites in Eastern and Central States, including a number of stations in the Ohio, Missouri, and Mississippi River basins. Decreases in DO concentration have occurred at scattered locations in Western and South-Central States, notably Oklahoma and Texas.

The observed trends indicating improving DO concentration may or may not be related to efforts of the past decade to control oxygen-demanding substances in water, including both point and non-point sources of those substances. In the absence of detailed information on changes in specific sources of organic pollution, it is impossible to be conclusive about the causes of trends in DO concentration at NASQAN stations, which are located on major U.S. rivers, typically draining areas of thousands of square miles. Future planned analysis of these data may shed further light on the causes of the observed trends.

Nevertheless, it is possible to proceed a further step towards separating man-induced changes in dissolved oxygen concentration from possible natural causes of the DO trends reported here. "Wet-year" versus "dry-year" effects are at least largely corrected for in figure 1 through flow adjustment, as referred above. But another important exogenous variable potentially affecting DO trends is temperature through its inverse relationship to the saturation level of dissolved oxygen. In the absence of other effects on DO, trends in water temperature (climatically induced or otherwise) would be expected to result in trends of the opposite direction in DO concentration. This effect can be corrected for by applying the trend testing procedures to values of DO "deficit" (calculated as saturation concentration minus observed concentration) based on water-temperature data collected at the time of DO sampling.

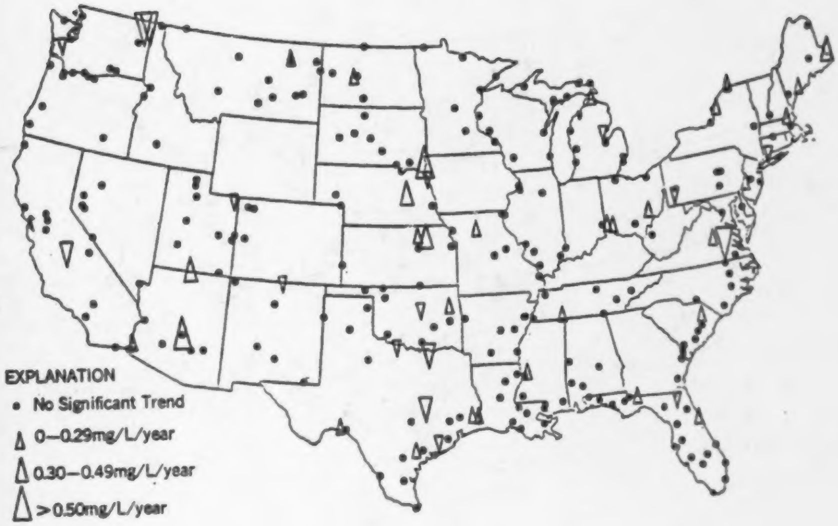
EXPLANATION
• No Significant Trend
Δ 0–0.29mg/L/year
Δ 0.30–0.49mg/L/year
Δ >0.50mg/L/year

Figure 1.-- Results of the Seasonal Kendall trend test applied to flow-adjusted measurements of dissolved oxygen concentration at NASQAN stations for the period October 1974 through October 1981. Triangles point in the direction of satistically significant ($p < 0.05$) trend.

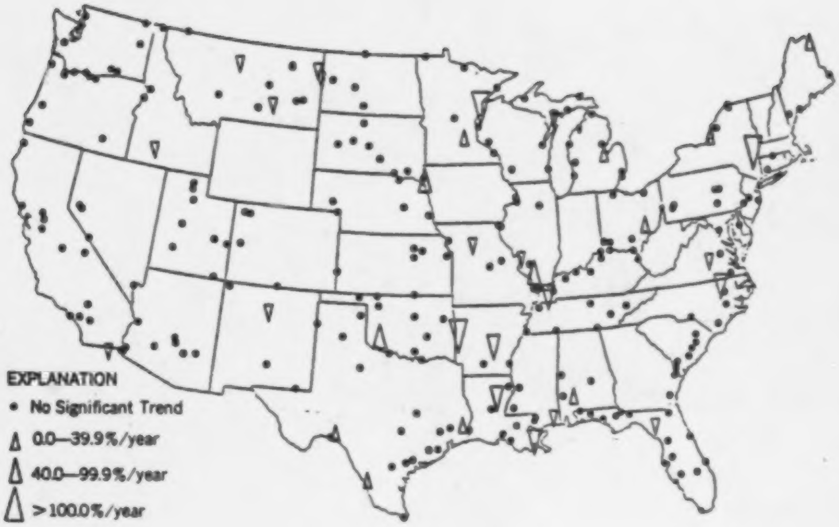
EXPLANATION
• No Significant Trend
△ 0.0—39.9%/year
△ 40.0—99.9%/year
△ >100.0%/year

Figure 2.--Results of the Seasonal Kendall trend test applied to flow-adjusted measurements of fecal coliform bacteria populations at NASQAN stations for the period October 1974 through October 1981. Triangles point in the direction of statistically significant ($p < 0.05$) trend.

The results of these tests are given in figure 3. Trends in DO deficit would be expected to result only from a change in the chemical or biological processes which add or remove oxygen from the water such as photosynthesis or organic decomposition. Approximately half of the stations showing trends in DO concentration in figure 1 (15 up trends and 7 down trends) show trends in DO deficit of the opposite direction in figure 3. The remaining half of the stations showing trends in DO concentration do not show significant opposing trends in DO deficit and thus would appear to represent situations where changes in temperature rather than changes in pollution loads are the cause of observed DO changes. Finally, certain stations showing trends in DO deficit in figure 3 do not show trends in DO concentration and apparently represent sites where there have been changes in pollution loads that are obscured in figure 1 by temperature changes.

Fecal coliform bacteria may originate in runoff from agricultural lands as well as discharges from populated areas, and both types of sources have been subject to pollution control efforts of the past several years. The majority of trends in fecal coliform bacteria (fig. 2) are in the direction of improving quality (21 down trends versus 12 uptrends). Stations showing declines in bacterial populations occur at widely-scattered locations, with about half occurring in the Missouri and Mississippi basins. Rising bacterial populations occur most frequently at stations in Eastern and Central States.

Again, it is impossible on the basis of presently available data to be conclusive about the causes of trends in either direction because of the many sources of fecal coliform bacteria in large rivers included in the NASQAN program.

REFERENCES

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Smith, R. A.. Hirsch, R. M., and Slack, J. R., 1982, A study of trends in total phosphorus measurements at NASQAN stations: U.S. Geological Survey Water-Supply Paper 2190, 34 p.

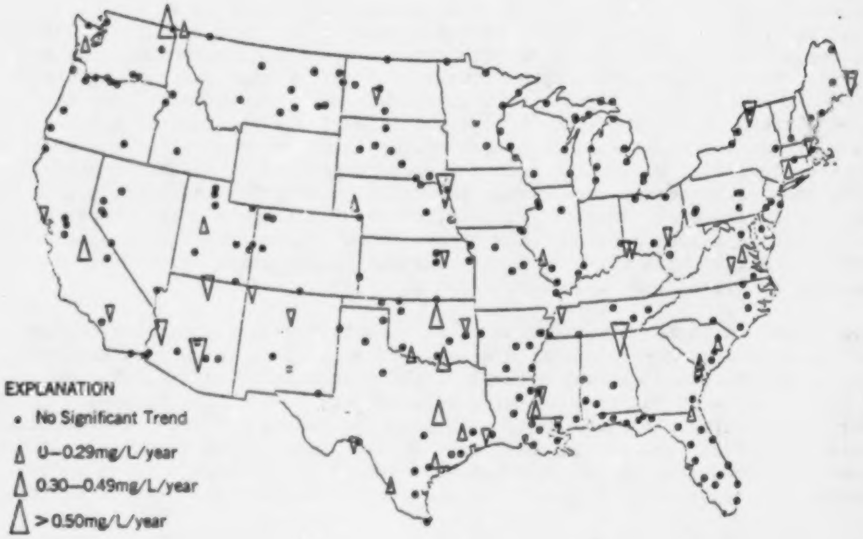

EXPLANATION
• No Significant Trend
△ 0–0.29mg/L/year
△ 0.30—0.49mg/L/year
△ >0.50mg/L/year

Figure 3.--Results of the Seasonal Kendall trend test applied to flow-adjusted measurements of dissolved oxygen deficit at NASQAN stations for the period October 1974 through October 1981. Triangles point in the direction of statistically significant ($p < 0.05$) trend.

Question 2.

At the time of the GAO report on water-quality monitoring in 1981, fixed-station sampling was generally limited to one sample per month. GAO criticized this as too infrequent to accurately describe water quality because rivers can change rapidly and extensively. However, the Survey, beginning with fiscal year 1983, established a new schedule of quarterly sampling at 232 of its 501 NASQAN stations and bimonthly sampling at the remaining stations.

o To what extent were the FY 1983 sampling frequency cutbacks due to technical factors versus funding reductions?

o Is it not true that less frequent sampling has made the Survey less able to assess water-quality problems?

o Can further cutbacks in sampling frequencies be expected for the Survey's fixed-station network?

Answer.

Cutbacks in sampling frequency at NASQAN stations actually began in fiscal year (FY) 1982. Projected costs for NASQAN were $1 M over FY 1981 levels, but at the beginning of that fiscal year available funding amounted to $1 M less than the previous year, resulting in a net $2 M shortfall in required resources.

In adjusting to these budget constraints, the Geological Survey also recognized its obligation to address the technical and philosophical comments concerning operation of its water-quality monitoring networks outlined in the GAO report and in two reports prepared by special network evaluation groups appointed by the Chief Hydrologist of the U.S. Geological Survey--one for NASQAN and one for the Hydrologic Bench-Mark Network. After careful consideration of all recommendations, the following actions were taken for operation of the two networks in FY 1982.

a. Except for some minor changes based on operational problems, all stations in both networks were retained.

b. The sampling frequency at all NASQAN sites was reduced from monthly to bimonthly. No changes in sampling frequency were made for the Bench-Mark program; it already had a mix of monthly, bimonthly, and quarterly sampling.

c. Some adjustment was made in the list of constituents measured on the basis of technical considerations.

In fiscal year 1983, the NASQAN budget remained at essentially the same level as the previous year despite increased operating costs. The following additional program changes were made in order to operate the network within the available budget.

a. The sampling frequency for NASQAN remained bimonthly at 269 sites but was reduced to quarterly at 232 sites. The sampling frequency at Bench-Mark stations was reduced to bimonthly at 9 sites and quarterly at 43 sites. The selection process for reducing the sampling frequency to quarterly involved the use of the results of trend analysis research conducted by the Geological Survey staff. Sampling frequency was reduced to quarterly if only four or less of the covered constituents at a given site showed a significant trend.

b. The collection and analysis of pesticide residues was discontinued due to loss of Environmental Protection Agency support for chemical analysis of the samples.

Although the reductions in sampling frequency for NASQAN and Bench-Mark stations during FY 1982 and FY 1983 were made on a technical basis to minimize loss of information from the networks, those reductions were the result of a shortfall of funds in relation to costs and would not have been made had funding for monthly sampling been available.

A major objective of the NASQAN program, in addition to establishing long-term mean values for concentrations and transport of substances in the major rivers of the Nation, is to detect changes or trends in these mean values. The information "cost" of a reduced sampling frequency can be viewed as a decrease in the likelihood that a trend or change in water quality will be detected (i.e., distinguished from "noise") within a given period of sampling. Alternatively, the "cost" can be viewed as an increase in time necessary to detect a trend or change that has occurred.

The increased likelihood of detecting a trend is a function of the rate of change of water quality in comparison to the "noise" level associated with a particular water-quality constituent. The following example which was developed using NASQAN data for the period when samples were collected 12 times per year, shows the effect of reduced sampling frequency on the number of trends detected in pH and suspended-sediment records at NASQAN stations. Statistical trend tests were applied first to the full monthly records (typically 8 years of data at each station), then to every other month, and finally to every third month. The results show that with decreased frequency of sampling, fewer trends are detected.

	No. of stations	No. of stations showing trends		
		Monthly	Bimonthly	Quarterly
pH	307	120	83	61
Suspended sediment	209	69	44	26

With regard to the increased time to detect a trend, Monte Carlo experiments indicate that an additional 2 years of bimonthly sampling are required at a station for which 11 years of monthly sampling are required to detect a trend.

Sampling frequencies will be adjusted in future years (either increased or decreased) depending partly on budgeting considerations and partly as a result of continued technical evaluation of the data.

Question 3:

Ground water represents the principal source of water for about 50 percent of the Nation and its contamination is of growing concern to this country. Stories appear frequently in the newspapers describing the closing of public and private drinking wells because of contamination by chemicals and other pollutants. Yet, no accurate data exist regarding the extent of ground-water contamination or its severity.

° Please describe the ground-water quality monitoring or data collection efforts underway at the U.S. Geological Survey (USGS) to determine the nature and extent of the contamination problem.

Answer:

The USGS currently conducts a wide range of programs which provide data and information on ground-water quality. These include a large number of ground-water investigations funded under the Federal/State Cooperative Program, several major investigations funded under the Regional Aquifer-System Analysis Program, and a number of studies funded under the Coal Hydrology Program and the Nuclear Waste Programs. While these studies always provide insight into the contamination problem, the level of information tends to vary widely depending on the objective and scale of the study. For this reason, a new series of investigations, specifically directed to the contamination problem, is being initiated under the Toxic Waste Ground-Water Contamination Program.

It is the viewpoint of the USGS that, because of the complexity of ground-water systems, a fixed point ground-water monitoring network would be a costly and ineffective method of evaluating the status of ground-water contamination on a national scale. It is also recognized that all ground-water resources of the Nation cannot be studied in detail at one time. Thus, the approach being taken under the new series of investigations is to conduct intensive hydrologic and geochemical investigations of individual areas which are representative of broader regions in terms of climate, ground-water hydrology, and human activities.

The set of areas to be studied under this program will cover the range of hydrogeologic and climatic environments recognized in the Nation, and will include representation of all major land use categories in each of these environments. For example, an individual study might include areas of agricultural, and industrial classification in a carbonate-aquifer terrain characterized by humid climate; another area might include mining, agricultural and residential zones in desert terrain with alluvial aquifers; and so on. Each area will be studied to determine ambient ground-water quality, directions and rates of ground-water flow, extent of contamination, and relationship of contamination to land use, ground-water flow patterns, and geochemical processes. The conclusions of the individual studies will provide principles and insights through which the nature and extent of the contamination problem nationwide can be estimated.

° What factors (i.e. technical or financial) impact on your abilities to acquire meaningful ground-water data?

Ground-water is a hidden resource, in which opportunities for data acquisition are always sparse. Samples can be obtained only from wells and springs; and where neither is present, the expense of drilling a well must be borne before a sample can be collected. If hazardous chemicals are thought to be present, expensive and time-consuming precautions must be taken in the drilling and sampling procedures. Moreover, ground-water flow patterns and chemical variations are always complex, so that a great deal of drilling and sampling may be required in order to develop meaningful interpretations. Once a sample is collected in the field, it must be transported to a laboratory for analysis. If the sample is thought to contain toxic chemicals, the transportation and the laboratory analysis again involves cumbersome and expensive procedures. Alternative field procedures, including surface geophysics, are expensive in themselves and are only a partial supplement to sampling and laboratory analysis. Finally, the complexities of solute transport and chemical reaction in ground-water require sophisticated and time-consuming techniques of data interpretation. Generally these techniques involve computer-based simulations of the flow, solute-transport, and chemical processes. The expenses for professional time, for computer time, and indeed for further development of the required analytical techniques, are substantial.

In summary, the movement and fate of contaminants in ground water is a complex subject in which acquisition and analysis of data is difficult, time-consuming, and costly. The U.S. Geological Survey has long been active in this field and in recent years we have significantly accelerated our efforts.

Question 4.

- How do you measure the success of your monitoring efforts?
- What are the criteria for success?

Answer.

We measure the success of our monitoring efforts by how well our programs meet national needs. The criteria for making such judgments are not hard and fast, but principally involve 1) the suitability of data for producing descriptive products that answer the questions implied in our program goals, as established by ourselves and others at the Federal, State, and local level, and 2) the successful use of monitoring data, and of our interpretation of the data, for the purpose of understanding and managing water resources. Continual evaluation by these criteria has led to evolving programs of water monitoring at several levels of detail, as described in the written testimony.

By way of illustration, some examples can be cited in which we feel that our monitoring efforts have clearly met the criteria for success. Data from the NASQAN monitoring network were used extensively by the Council on Environmental Quality (CEQ) in their 1981 publication "Environmental Trends"; and we have supplied CEQ, at their request, with trend results and our interpretive analysis for dissolved oxygen at NASQAN stations to be used in their upcoming annual report. For every NASQAN station, statistical summaries, transport estimates, and trend analyses have been accomplished for all constituents measured, and these results will figure prominently in several of our forthcoming publications. The Bench-Mark program has produced valuable long-term information on trends in factors related to acidification of streams by acid precipitation, and the results and interpretation are complete and have been submitted for publication, as discussed at the Subcommittee hearing.

An example of the success of USGS monitoring on a river-basin scale is provided by the Colorado River Basin. In addition to our network operations on the Colorado, USGS has conducted numerous special investigations in cooperation with State and local governments; the information generated by these studies supplements and extends that which is available directly from the networks. Examples of the data which have been collected and the way they have been used are summarized on the attached document.

Finally, the process of evaluating our monitoring effort according to our criteria for success often leads to beneficial changes in our programs. One good example of this is underway in our streamflow monitoring program. The USGS is presently undertaking a detailed statistical analysis of the location and frequency of streamflow measurements. We are finding that, in many cases, measurement costs can be significantly reduced with little or no loss of information.

- What kind of quality assurance program do you have?
- What have the findings of your quality assurance program been?

Answer.

The USGS maintains an extensive quality assurance program for its entire water activity. In the field of water-quality data, this program addresses the areas of field data collection, materials testing, and laboratory analyses.

Quality assurance of field activities depends on technicians and professionals trained in data collection and sampling techniques, and on regular review of field activities by experienced, senior personnel. Quality-assurance support to the field is provided by a materials testing project that provides standardized materials for evaluation of field instrumentation, supplies, and techniques.

The quality-assurance program for laboratories covers not only U.S. Geological Survey facilities, but other analytical laboratories that furnish data to the Survey. Active programs include laboratory evaluations, preparation and use of reference materials, and independent review of analytical data.

The overall result of the quality-assurance program has been an increased awareness on the part of all personnel of the need to follow exactly the prescribed procedures for sampling, analysis, and data reporting. An examination of the reports of the technical reviews of field and laboratory activities conducted during the last 5 years indicates that the quality of the data-collection program is high and continues to improve.

ATTACHMENT TO QUESTION #4

Water Quality Information for Colorado River Basin

- Geological Survey provides sediment data to the Bureau of Reclamation and other users for designing reservoirs and canals.
- Sediment information is invaluable. The life of a water project is determined by the amount of trapped sediment.
- Decisions on releases from Imperial Dam (deliveries to Mexico) are based on water-quality data provided by the Geological Survey. These data are used by the International Boundary and Water Commission and the Bureau of Reclamation to comply with Minute 242 of the U.S.-Mexico treaty. This Minute deals with the salinity levels of water delivered to Mexico.
- Virtually all of the water-quality data used to compile the biannual Bureau of Reclamation report to Congress on water quality in the Colorado River basin comes from the U.S. Geological Survey.
- USGS has identified the major natural salinity sources. This has been used by the Bureau of Reclamation in cooperation with W. R. Grace, Inc. in identifying sources of highly saline water for use in Aquatrain (a scheme to export coal by using saline water, thus reducing salinity in the Colorado basin).
- Data collected by USGS in the cooperative programs in Arizona and Colorado have identified [illegible] contaminated surface and ground water due to metals mining. This [illegible] is needed by EPA and the Bureau of Mines.
- Studies of runoff and ground-water quality near coal mines, as well as nearby pristine areas, in the basin have been used by BLM in making permitting decisions on future coal mines and for setting standards for coal mining or power plant operations.
- USGS has provided data to the Bureau of Reclamation concerning phreatophyte control as a means of salvaging water. This has implications in terms of water quality as well as quantity.
- USGS studies of ground-water quality have been used repeatedly on Indian reservations to locate potable water supplies for the tribes.
- USGS has collected the water-quality data in the Piceance Basin of Colorado, the largest reserve of oil shale in the U.S. This information has been used to aid in the evaluation of leases of oil shale by the BLM. It has been the basic source of information on the potential impacts of mine dewatering, specifically pollution of surface water with naturally occurring substances which are harmful to crops and wildlife.
- Water quality information is collected in the Colorado River Basin for resource planning, management, design of structures, and to meet legal requirements. Some current uses by Federal agencies of water-quality data collected in the New Mexico part of the U.S. Geological Survey are as follows:

Agency	Type of Data	Use of Information
Bureau of Reclamation	Sediment	Reservoir and canal design
	Water quality	Salinity abatement project (international commitment)
Bureau of Indian Affairs	Water quality	Location of potable supplies
Bureau of Laud Management	Sediment Water quality	Identification and prediction of hydrologic effects of coal mining on Federal lands (coal leasing in Four Corners area)
National Park Service	Water quality	Minitoring effects of upstream mining and other energy-related activities (Chaco Canyon National Monument)
Minerals Management Service	Water quality	Impact of mine dewatering (Kin-min-oli Wash)
International Boundary and Water Commission	Water quality	Compliance with U.S.-Mexico Treaty re salinity of Colorado River.

o The Bureau of Reclamation, in their 1979 water-quality report to Congress, stated:

"The Geological Survey provided most of the basic data. It also prepared a technical study on salinity in the Flaming Gorge Reservoir and a study of the geologic factors that affect salinity in the Upper Colorado River Basin. A continuing cooperative program between the Bureau of Reclamation and the Survey for the collection of streamflow quality data and the exchange of information has been in effect for a number of years. This cooperation provides for the collection of data at stations other than basic data stations maintained by the Geological Survey in order to obtain additional data at key points in the basin.

In the Upper Basin, data are obtained at various points along the river and in drains cooperatively with the Geological Survey and other agencies. Along the main stem below Lees Ferry, data are obtained on a regular basis at a network of stations that includes essentially all significant diversions, surface return flows, and major river stations. The Bureau of Reclamation is the lead agency of an ongoing task force for coordinating the collection of other quality data in the Lower Basin. Other members of the task force are composed of representatives from the Geological Survey, International Boundary and Water Commission, and Environmental Protection Agency."

The Colorado River Basin Salinity Control Act PL93-320 authorizes construction of a desalting plant and associated canals near Yuma, Arizona, four other specific salinity control projects (Paradox Valley, Las Vegas Wash, Grand Valley, and Crystal Geyser), and the expedited planning of 12 other salinity control projects. The intent of all of these projects is to enable the U.S. to comply with its agreement with Mexico concerning the quality of the water we deliver to them under our 1944 treaty, as well as to prevent more deterioration of water delivered to irrigators, industries, and municipalities throughout the Colorado River Basin. The estimated cost of the deslating plant, related canals, and the four authorized projects is $817 million, and operating costs for the desalting plant is expected to be $14 million per year. The 1982 appropriation for these projects was $38.2 million. The Bureau of Reclamation has estimated that damages attributable to salinity in the Colorado River Basin were $53 million per year in 1973. In contrast to these project and damage costs, the expenditures of USGS for streamflow and water-quality data collection throughout the Colorado River Basin was about $3.4 million per year in 1982. The USGS provides most of the data which enables the Bureau of Reclamation to determine the effectiveness of these mitigation measures and to evaluate trends in salinity in the river and its tributaries. Of course, the monitoring of salinity problem is only one of the many end uses for this $3.4 million program of flow and quality measurement.

Question 5.

You have heard Mr. Walter Lyon explain what he would like to see in a national environmental monitoring program. You have also heard Mr. Lyon recommend establishing a commission to develop a national environmental monitoring program, and to conduct annual workshops on environmental monitoring.

° What is your opinion about the need for a national environmental monitoring program as described by Mr. Lyon?

Answer

Environmental monitoring involves many different agencies at Federal, State, and local levels, as well as the private sector and research institutions. It involves a variety of media: air (emissions and ambient), water (emissions and ambient, ground water and surface water), land (soils, solid waste disposal) and organisms (plants and animals). It also fulfills a number of different purposes (enforcement, research, and long-term ambient monitoring to determine effectiveness of programs and to identify new problems).

We find that there are numerous situations where our understanding of the environment requires cutting across many of these boundary lines. For example, studies of acidification of streams depends on monitoring of water (long-term ambient monitoring program in surface water and ground water as well as emissions of acids directly to rivers), but it also relies on air (ambient and emissions), land (soils), and organism (fish) monitoring to provide an integrated assessment of long-term changes, sources of variation, and causal predictions of future conditions and impacts. As another example, studies of nutrient enrichment in surface-water bodies require data on water (emissions and ambient), as well as air, land, and organisms, in order to sort out sources of nutrients (point source, manmade nonpoint sources, natural, airborne) and sort out and predict impacts on physical-chemical characteristics as well as biological productivity of water bodies.

It would be difficult for a single monitoring program to encompass all of these elements. Moreover, because the data required for environmental monitoring are frequently already collected by Federal, State, and local agencies for other purposes - e.g., the management of natural resources - creation of a single environmental monitoring program would not, in itself, necessarily lead to increased efficiency and elimination of duplication.

° Do you have any additional suggestions regarding how a national program could be implemented?

Answer.

At the Federal level, a large part of the available environmental data resides with three agencies: NOAA, EPA, and the Geological Survey. Bilaterial coordinating committees are maintained between the Geological Survey and each of these other agencies, and efforts are made at every level in the three organizations to maintain communication, coordinate scientific effort, and avoid unnecessary duplication.

In addition, our Office of Water Data Coordination has the lead role in establishing a coordinated effort among all Federal agencies in the area of water-data collection. Finally, our Federal/State Cooperative Program gives us the opportunity to interact with State and local agencies involved in environmental data collection, again with the aim of establishing coordinated scientific efforts and avoiding duplication. We feel that continued pursuit of these coordination efforts offers the best opportunity to achieve a consistent national environmental monitoring effort.

Question 6:

Do you have any other suggestions that you would like to make that would lead to improvements in environmental monitoring?

Answer:

As stated in response to an earlier question, simple fixed station monitoring is not an effective method of assessing ground-water contamination. Data on ground-water contamination cannot be interpreted or evaluated without an understanding of local ground-water flow patterns, and of background water chemistry. Thus any ground-water contamination monitoring effort should always be preceded by a thorough hydrogeologic investigation, and should be accompanied by continuing efforts to refine and update understanding of the hydrogeology. Attempting to do this on a national scale would quickly exhaust the resources of any Federal agency. Alternatively, however, certain measures can be taken to enhance the hydrogeologic competence of State and local authorities, and thus to contribute to effective ground-water quality monitoring at the water management level. The Cooperative Program of the Water Resources Division of the USGS provides an avenue for this type of technology transfer.

QUESTIONS FOR MR. LLOYD N. CLAUSING

1. FEDERAL USE OF DATA COLLECTED BY STATES AND REGIONAL COMMISSIONS

IN YOUR TESTIMONY YOU STATE THAT EPA CARRIES OUT A VERY LIMITED PROGRAM OF MONITORING IN THE OHIO VALLEY, AND THE U.S. GEOLOGICAL SURVEY OPERATES ONLY SEVERAL STATIONS AS PART OF ITS NATIONAL STREAM QUALITY ACCOUNTING NETWORK. HOWEVER, YOUR COMMISSION HAS HUNDREDS OF SAMPLING POINTS, AND YOU SAMPLE MORE FREQUENTLY THAN THE FEDERAL STATIONS.

LAST WEEK THE GEOLOGICAL SURVEY REPRESENTATIVE DESCRIBED SOME RESULTS FROM ITS NETWORKS, BUT MADE LITTLE MENTION OF THE GREATER AMOUNTS OF DATA AVAILABLE FROM THE STATES AND REGIONS.

- ARE DATA OBTAINED BY YOUR COMMISSION AVAILABLE TO THE U.S. GEOLOGICAL SURVEY AND OTHER FEDERAL AGENCIES?
- IN YOUR OPINION, ARE FEDERAL AGENCIES FULLY UTILIZING DATA COLLECTED BY STATES AND REGIONAL COMMISSIONS IN DRAWING CONCLUSIONS ABOUT THE QUALITY OF OUR NATION'S WATER RESOURCES?

2. ROLES OF FEDERAL, STATE, AND LOCAL GOVERNMENTS, AND REGIONAL COMMISSIONS, IN A NATIONAL ENVIRONMENTAL MONITORING PROGRAM

IN YOUR TESTIMONY YOU STATE, THAT A CLEAR NEED FOR YOUR ORGANICS DETECTION SYSTEM IS INTELLIGENCE ON THE SIGNIFICANCE OF THE CHEMICALS BEING DETECTED. YOU ALSO STATE THAT ANOTHER CRITICAL NEED IS FOR A MORE EFFECTIVE AND USABLE METHODOLOGY FOR A WIDE RANGE OF ORGANICS.

- DO YOU CONSIDER THESE TO BE APPROPRIATE CONTRIBUTIONS FROM THE FEDERAL GOVERNMENT IN A NATIONAL ENVIRONMENTAL MONITORING PROGRAM?
- WHAT OTHER TYPES OF PARTICIPATION ARE APPROPRIATE FOR THE FEDERAL GOVERNMENT?
- WHAT SHOULD THE STATES, REGIONAL COMMISSIONS, AND LOCALITIES DO?

3. TRANSFERABILITY OF MONITORING CONCEPTS TO OTHER AREAS OF THE COUNTRY, AND FEDERAL GOVERNMENT ROLE IN THE TRANSFER

YOUR COMMISSION'S MONITORING SYSTEM HAS BEEN THE SUBJECT OF CONSIDERABLE PRAISE BY OUR FIRST WITNESS LAST WEEK, AND OTHER PEOPLE WE HAVE BEEN IN CONTACT WITH WHILE SETTING UP THESE HEARINGS.

- ARE YOU AWARE OF MONITORING SYSTEMS WHICH ARE AS EFFECTIVE FOR OTHER RIVER BASINS OF THE NATION?
- WOULD THE TECHNICAL, MANAGEMENT, AND ORGANIZATIONAL FEATURES DEVELOPED IN ESTABLISHING YOUR COMMISSION'S MONITORING SYSTEM BE READILY TRANSFERABLE TO OTHER AREAS OF THE COUNTRY?
- WOULD THE FEDERAL GOVERNMENT HAVE A ROLE IN THIS TRANSFER? WHAT WOULD THAT ROLE BE?

OHIO RIVER VALLEY
WATER SANITATION COMMISSION
414 WALNUT STREET, CINCINNATI OHIO 45202 (513) 421-1151

June 29, 1983

1. This Commission presently has 51 active stations. The enclosed map indicates station locations and their type. However, over the years we have sampled at a large number of stations, most of which are no longer active. Should you be interested, I am also enclosing a copy of this master list.

a. All data which we generate are entered into STORET and hence are available not only to the federal and state agencies but to any individual or entity with access capability to STORET. Additionally, we publish a monthly monitor which summarizes the results of our monitoring operations.

b. Federal agencies are utilizing data collected by states and regional commissions but not "fully". This Commission has been designated by its member states to compile data for the Ohio River and to prepare a biennial Water Quality report as required by the Clean Water Act. This report is appended to the member states' reports that are eventually submitted to Congress by the US EPA administrator. In the Ohio Valley, the Corps of Engineers utilizes (and partially funds) this Commission's electronic monitoring system. The Corps utilizes this data in the operation of navigation facilities on the Ohio River. We have coordinated activities for fish studies with U.S. FDA and U.S. Fish and Wildlife.

2. I feel it would be most appropriate for the federal government to develop information on the significance of chemicals detected through our Organics Detection System. Presently, some of this information is available through US EPA's Priority Pollutants document reports. However, for many of the

An interstate agency representing: Illinois · Indiana · Kentucky · New York · Ohio · Pennsylvania · Virginia · West Virginia

chemicals detected, there is little information available other than that found in standard text books.

The magnitude of this needed research is great and beyond the resources of any individual state or regional commission. Since the significance of the chemicals would have nationwide application, it is most appropriate that this research activity be done by the federal government.

3. Commissions such as the Interstate Sanitation Commission monitor conditions in the lower Hudson River, East River, parts of Long Island Sound and upper and lower New York Bays. The Delaware River Basin Commission does monitoring on the Delaware River. Other commissions may do monitoring but to my knowledge most of it centers in the Northeast. The type and intensity of monitoring varies significantly.

a. Our specific systems may not be entirely appropriate in other areas but we feel that the basic design-goals could be employed effectively in many river systems. Most recently we have entertained representatives from Louisiana state agencies, industries and US EPA Region VI for a close look at the Organics Detection System. We have hosted visitors from a number of other countries who come to review our operations and monitoring systems.

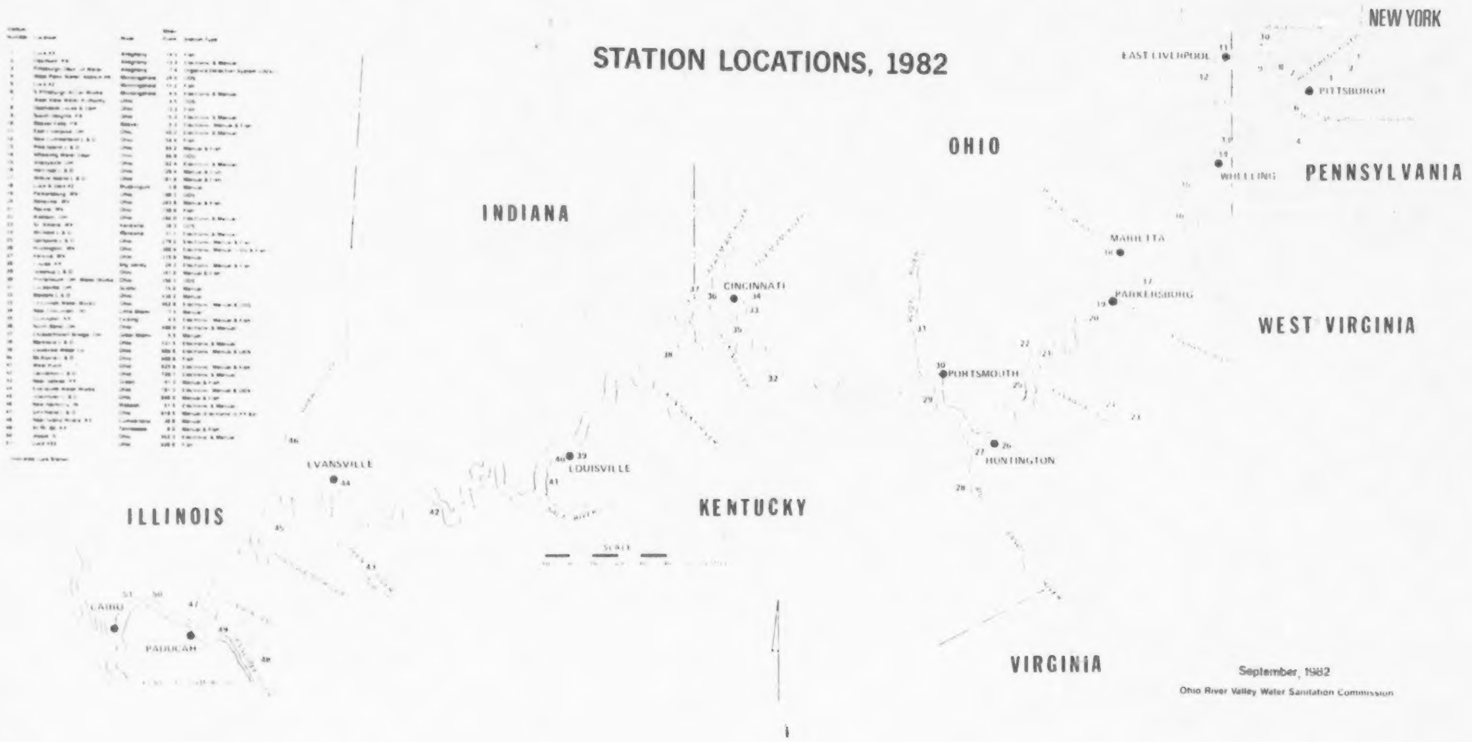
b. The federal government could most effectively disseminate technical information concerning the monitoring systems from all river basins among all the states. Further, it could play an important coordinative and overview role and thereby facilitate national as well as regional evaluations. However, the operation of water quality monitoring systems is another matter. Because of regional and interstate aspects it would appear that political organizations formed on a problem shed (River basin) mode are the most effective tools for operating such a system. Federal agencies should encourage regional organization and cooperation, but in the continued absence of such vehicles Federal agencies must provide needed problem shed attention to the problem. We feel strongly that flexibility must be in place to have an effective operating system to respond to needs quickly and to generate the desired information. This can best be achieved as described above.

Again, I thank you for the opportunity to respond to these queries.

Sincerely,

Lloyd Clausing
Chairman

STATION LOCATIONS, 1982


NEW YORK
PENNSYLVANIA
OHIO
WEST VIRGINIA
INDIANA
ILLINOIS
KENTUCKY
VIRGINIA
EAST LIVERPOOL
PITTSBURGH
WHEELING
MARIETTA
PARKERSBURG
PORTSMOUTH
HUNTINGTON
CINCINNATI
LOUISVILLE
EVANSVILLE
CAIRO
PADUCAH
SCALE

September, 1982

Ohio River Valley Water Sanitation Commission

MASTER LIST

Primary Station No.	Secondary Station No.	Description	State/County Code	Lat.-Long.No.	Type
AR1973R	29	Allegheny R. @ Kinzua Dam, PA.	42123	415038007908580	E
AR-52.6F		Allegheny R. @ Lock #8, PA.	42005	405326007902905	F
AR30.4R	30	Allegheny R. @ Lock & Dam #5, PA.	42005	404100007940080	E
KI10.9R	31	Kiskiminetas R. @ Vandergrift, PA.	42129	403620007933150	E
AR-14.5F		Allegheny R. @ Lock #3, PA.	42003	403212007929030	F
AR.13.3R	10	Allegheny R. @ Oakmont, PA.	42003	403151007950120	E
AR12.3	233*	Allegheny R. @ Oakmont, PA.	42003	403150007950140	W
AR12.8M	1233	Allegheny R. @ Oakmont, PA.	42003	403151007950120	M
AR-8.9	231	Allegheny R. @ Wilkensburg, PA.	42003	402855007952380	W
AR7.40	020DS	Allegheny R. @ Pittsburgh, PA.	42003	402940007949300	O
MR-61.5F		Monongahela R. @ Maxwell Lock, PA.	42051	400000007957340	F
MR42.6R	09*	Monongahela R. @ Charleroi, PA.	42125	400830007953350	E
MR42.5	239*	Monongahela R. @ Charleroi, PA.	42125	400757007953250	W
MR24.5	010DS	Monongahela R. @ Western Pa.Water Co.	42125	401500007949300	O
YR15.5	*	Youghiogheny R. @ McKeesport, PA.	42003	402115507951460	W
MR15.5	241	Monongahela R. @ McKeesport, PA.	42003	402115507951460	W
MR-11.2F		Monongahela R. @ Lock #2, PA.	42003	402345007952070	F
MR-4.5R	32	Monongahela R. @ So. Pittsburgh, PA.	42003	402436007957150	E
MR-4.5M	1237	Monongahela R. @ So. Pittsburgh, PA.	42003	402436007957150	M
MR-4.0	237	Monongahela R. @ So. Pittsburgh, PA.	42003	402438007957150	W
OR9789	206*	Ohio River @ Reed Power, PA.	42003	402753008002230	W
OR976.50	030DS	Ohio R. @ West View, PA.	42003	402934008004180	O
OR967.7F		Ohio R. @ Dashields Lock, PA.	42007	403505008016000	F
OR9658R	08	Ohio R. @ So. Heights, PA.	42003	403412008013470	E
OR9658M	1201	Ohio R. @ So. Heights, PA.	42003	403412008013470	M
OR9652	201*	Ohio R. @ So. Heights, PA.	42003	403414008013480	W
BR-5.3R	06	Beaver R. @ Beaver Falls, PA.	42007	404548008018550	E
BR-5.3M	1242	Beaver R. @ Beaver Falls, PA.	42007	404548008018550	M
BR-5.3	242	Beaver R. @ Beaver Falls, PA.	42007	404548008018550	W
OR9408R	33	Ohio R. @ East Liverpool, OH	39029	403820008031150	E
OR9408M	1500	Ohio R. @ East Liverpool, OH.	39029	403820008031150	M
OR9272R	05*	Ohio R. @ Stratton, OH.	39081	403100008037220	E
OR926.6F		Ohio R. @ New Cumberland Lock, OH.	54029	402945008035300	F
OR9267	500*	Ohio R. @ Stratton, OH.	39081	403119008037345	W
OR9219	507*	Ohio R. @ Toronto, OH.	39081	402758508035525	W

Primary Station No.	Secondary Station No.	Description	State/County Code	Lat.-Long.No.	Type
OR9194	403	Ohio R. @ Weirton Steel, WV.	54029	402454008036195	W
OR9192	402*	Ohio R. @ Weirton, WV.	54029	402458508036195	W
OR9157	505	Ohio R. @ Steubenville, OH.	39081	402130008036330	W
OR9017	404*	Ohio R. @ Power, WV.	54009	401234508039465	W
OR8975	502	Ohio R. @ Yorkville, OH.	39081	400936008042045	W
OR8968M	1405	Ohio R. @ Pike Island, WV.	54069	400859008042060	M
OR896.8F	1405F	Ohio R. @ Pike Island, WV.	54069	400859008042060	F
OR8945	405	Ohio R. @ Wheeling, WV.	54069	400418008043345	W
OR894.2	040DS	Ohio R. @ Wheeling, WV.	54069	400418008043345	O
OR8818	406	Ohio R. @ Moundsville, WV.	54051	395509008045060	W
OR8786R	34	Ohio R. @ Shadyside, OH.	39013	395431008045350	E
OR8786M	1521	Ohio R. @ Shadyside, OH.	39013	395431008045350	M
OR8616	407	Ohio R. @ Natrium, WV.	54051	394443508050405	W
OR854.6F	1423F	Ohio R. @ Hannibal Lock, WV.	54103	393810008052310	F
OR8516M	1423	Ohio R. @ Hannibal Lock, WV.	54103	393810008052310	M
OR8205	408*	Ohio R. @ Willow Island, WV.	54073	392136008118495	W
OR8204R	16*	Ohio R. @ Willow Island, WV	54073	391500008115000	E
OR8192M	1408	Ohio R. @ Willow Island Dam, WV.	54073	392128008119090	M
OR819.2F	1408F	Ohio R. @ Willow Island Lock, WV.	54073	392128008119090	F
MU66.8	534*	Muskingum R. @ Philo, OH.	39119	395137508154555	W
MU28.0R	04*	Muskingum R. @ Beverly, OH.	39039	393327008138000	R
MU28.0	532	Muskingum R. @ Beverly, OH	39039	393327008138465	W
MU-5.8M	1531	Muskingum R. Near Marietta, OH.	39167	392813008129280	M
OR7965	409	Ohio R. @ Parkersburg, WV.	54107	391613508133570	W
OR790.7	050DS	Ohio R. @ Parkersburg, WV.	54107	391546008140040	O
OR7771M	1421	Ohio R. @ Belleville Dam, WV.	54107	390707008144320	M
OR777.1F	1421F	Ohio R. @ Belleville Dam, W	54107	390707008144320	F
OR7394R	14*	Ohio R. @ New Haven, WV.	54053	385745008145300	E
OR7394	411	Ohio R. @ New Haven, WV.	54053	385921008158165	W
OR7210R	37	Ohio R. @ Addison, OH.	39053	385449008207390	E
OR7210M	1510	Ohio R. at Addison, OH.	39053	385449008207390	M
OR7196	510	Ohio R. @ Addison (Kyger Creek), OH.	39053	385313508208450	W
NR1939R	28*	New River @ Glen Lyn, VA.	51071	365200008952000	E
NR93.9	366*	New River @ Glen Lyn, VA.	51071	372215008051390	W
KR82.8F		Kanawha R. @ London Lock, WV.	54039	381200008122150	F
KR72.0	454*	Kanawha River @ Cabin Creek, WV.	54039	381158008128430	W
KR38.3	060DS	Kanawha River @ St. Albans, WV.	54039	382330008149560	O

Primary Station No.	Secondary Station No.	Description	State/County Code	Lat.-Long.No.	Type
KR31.1R	03	Kanawha R. @ Winfield, WV.	54053	383132008154400	E
KR31.1M	1450	Kanawha R. @ Winfield, WV.	54053	383132008154400	M
KR31.1F	1450F	Kanawha R. @ Winfield, WV.	54053	383132008154400	F
OR7018R	39	Ohio R. @ Gallipolis Dam, WV.	54053	384054008211170	E
OR7018M	1422	Ohio R. @ Gallipolis Dam, WV.	54053	384054008211170	M
OR701.8F	1422F	Ohio R. @ Gallipolis Dam, WV.	54053	384054008211170	F
OR6741R	02	Ohio River @ Huntington, WV.	54011	382557008225570	E
OR6741M	1412	Ohio River @ Huntington, WV.	54011	382557008225570	M
OR674.1	07ODS	Ohio R. @ Huntington, WV.	54011	382557008225570	O
OR674.1F	1412	Ohio R. @ Huntington, WV.	54011	382557008225570	F
OR6740	412	Ohio R. @ Huntington, WV.	54011	382524008225030	W
OR6652M	1523	Ohio R. @ Kenova, WV.	54099	382421008234240	M
OR6630	506*	Ohio R. @ South Point, OH.	39087	382500008235240	W
SR20.3R	17	Big Sandy R. @ Louisa, KY.	21127	381016008238050	E
SR20.3M	1630	Big Sandy R. @ Louisa, KY.	21127	381016008238050	M
SR20.3F	1630	Big Sandy R. @ Louisa, KY.	21127	381016008238050	F
SR20.3	630*	Big Sandy R. @ Louisa, KY.	21127	380633008235570	W
OR6400M	1621	Ohio R. @ Greenup Dam, KY.	21089	383848008251380	M
OR640.0F	1621F	Ohio R. @ Greenup Dam, KY.	21089	383848008251380	F
SC15.0M	1538	Scioto R. @ Lucasville, OH.	39145	385252008301030	M
OR6303	503*	Ohio R. @ Portsmouth, OH.	39145	384345008259495	W
OR630.9	08ODS	Ohio R. @ Portsmouth, OH.	39145	384345008259495	O
OR5448R	24*	Ohio R. @ Meldahl Dam, OH.	39025	384750008410000	E
OR5448M	1511	Ohio R. @ Meldahl Dam, OH.	39025	384750008410000	M
OR544.8F	1511F	Ohio R. @ Meldahl Dam, OH.	39025	384750008410000	F
OR5292R	18*	Ohio R. @ Beckjord (New Richmond),OH.	39025	385400008315000	E
OR5182R	01	Ohio R. @ Cincinnati, OH.	39061	390411008425570	E
OR5182M	1504	Ohio R. @ Cincinnati, OH.	39061	390411008425570	M
OR518.2	09ODS	Ohio R. @ Cincinnati, OH.	39061	390411008425570	O
OR5182	504	Ohio R. @ Cincinnati, OH.	39061	390411008425570	W
LM-7.5M	1571	Little Miami R. @ Cincinnati, OH.	39061	390633008424060	M
LM-3.4R	23*	Little Miami R. @ Cincinnati, OH	39025	391017008417530	E
LR-4.5R	21	Licking R. @ Kenton County, KY.	21117	390305008429420	E
LR-4.5M	1634	Licking R. @ Kenton County, KY.	21117	390305008429420	M
LR-4.5F	1634F	Licking R. @ Kenton County, KY.	21117	390305008429420	F
OR5097R	19*	Ohio R. @ West End (Cincinnati), OH.	39061	390402008432300	E
OR5035	509*	Ohio R. @ Anderson Ferry (Cinti), OH	39061	390428508437120	W

Primary Station No.	Secondary Station No.	Description	State/County Code	Lat.-Long.No.	Type
OR5019R	26*	Ohio R. @ Anderson Ferry (Cinti),OH.	39061	390730008432300	E
OR4910R	07*	Ohio R. @ North Bend, OH.	39061	390630008448315	E
OR4910M	1508	Ohio R. @ North Bend, OH.	39061	390630008448315	M
OR4907	508	Ohio R. @ Miami Fort, OH.	39061	390630008448315	W
GM-5.5R	25*	Great Miami R. @ Lost Bridge, OH.	39061	390911008447380	E
GM-5.5M	1551	Great Miami R. @ Lost Bridge, OH.	39061	390911008447380	M
OR4843R	27*	Ohio R. @ Aurora, IN.	18029	390707008445000	E
OR4500M	1600	Ohio R. @ Markland Dam, KY.	21077	384629008457520	M
OR4499R	22	Ohio R. @ Markland Dam, IN.	18155	384500008507000	E
OR449.5F	1600F	Ohio R. @ Markland Dam, KY.	21077	384629008457520	F
OR4215R	20*	Ohio R. @ Clifty Creek (Madison)IN.	18077	384409008522150	E
OR4215	702	Ohio R. @ Madison, IN.	18077	364409008522015	W
OR3804R	11	Ohio R. @ Louisville, KY.	21111	381652008542080	E
OR3804M	1601	Ohio R. @ Louisville, KY.	21111	381652008542080	M
OR380.4	100DS	Ohio R. @ Louisville, KY.	21111	381652008542080	O
OR3804	601	Ohio R. @ Louisville, KY.	21111	381649508542105	W
OR374.2F		Ohio R. @ McAlpin Lock, KY.	21111	381640008547300	F
OR3642R	12*	Ohio R. @ Cane Run (Louisville), KY.	21111	382200008550000	E
OR3551R	35	Ohio R. @ West Point, KY.	21111	380205008554510	E
OR3551M	1622	Ohio R. @ West Point, KY.	21111	380205008554510	M
OR355.1F	1622F	Ohio R. @ West Point, KY.	21111	380205008554510	F
OR2603R	41	Ohio R. @ Cannelton Dam, IN.	18123	375358008642200	E
OR2603M	1721	Ohio R. @ Cannelton Dam, IN.	18123	375358008642200	M
OR260.3F	1721F	Ohio R. @ Cannelton Dam, IN.	18123	375358008642200	F
GR41.3M	1656	Green R. @ Spottsville, KY.	21101	375530008718150	M
GR-41.3F	1656F	Green R. @ Seebree, KY.	21101	375530008718150	F
OR205.0F		Ohio R. @ Newburgh Dam, IN.	18173	375551008722530	F
OR1895R	15	Ohio R. @ Evansville, IN.	18163	375820008734350	E
OR1895M	1703	Ohio R. @ Evansville, IN.	18163	375820008734350	M
OR189.5	110DS	Ohio R. @ Evansville, IN.	18163	375820008734350	O
OR1895	703	Ohio R. @ Evansville, IN.	18163	375820008734350	W
OR1350M	1722	Ohio R. @ Uniontown, KY.	21225	374800008759000	M
OR135.0F	1722F	Ohio R. @ Uniontown, KY.	21225	374800008759000	F
WA9295R	43	Wabash R. @ New Harmony, IN.	18129	380755008756250	E
WA9295M	1741	Wabash R. @ New Harmony, IN.	18129	380755008756250	M
WA1740R	13*	Wabash R. @ Hutsonville, IL.	17033	390700008740000	E
OR62.5R	48	Ohio R. @ Smithland Dam, IL.	17151	370845008824250	E

Primary Station No.	Secon ary Station No.	Description	State/County Code	Lat.-Long.No.	Type
OR62.5M	1820	Ohio R. @ Smithland Dam, IL.	17151	370845008824250	M
OR62.5F	1820F	Ohio R. @ Smithland Dam, IL.	17151	370845008824250	F
CR30.6M	1645	Cumberland R. near Grand Rivers, KY.	21129	370118008813160	M
TR-6.0M	1650	Tennessee R. near Paducah, K	21145	370216008831460	M
TR-6.0F	1650F	Tennessee R. near Paducah, KY.	21145	370216008831460	F
OR28.7R	46	Ohio R. @ Joppa, IL.	17127	371200008851000	E
OR28.7M	1821	Ohio R. @ Joppa, IL.	17127	371200008851000	M
OR18.4F		Ohio R. @ Lock & Dam 53, IL.	17153	371210008902300	F

W - Water Users
E - Electronic
M - Manual
O - ODS
F - Fish
* - Inactive

QUESTIONS FOR MR. WILLIAM W. SYLTE

1. NEED FOR AN ADEQUATE AMBIENT DATA BASE FOR TOXIC POLLUTANTS

A LARGE PART OF YOUR TESTIMONY RELATES TO THE NEED FOR AN ADEQUATE AMBIENT DATA BASE FOR TOXIC POLLUTANTS. HOWEVER, IN THE TESTIMONY SUBMITTED BY EPA AT LAST WEEK'S HEARING IT STATES THAT THE AGENCY HAS NO PLANS FOR ESTABLISHING A ROUTINE, NATIONAL NON-CRITERIA POLLUTANT MONITORING PROGRAM SUCH AS WE HAVE FOR CRITERIA POLLUTANTS.

- O IN YOUR OPINION, IS A ROUTINE, NATIONAL NON-CRITERIA POLLUTANT MONITORING PROGRAM NEEDED?
  - O IF NEEDED, THEN PLEASE COMMENT ON EPA'S LACK OF PLANS TO ESTABLISH SUCH A PROGRAM.
  - O IF NOT NEEDED, THEN WHAT KIND OF A MONITORING PROGRAM DO WE NEED FOR NON-CRITERIA POLLUTANTS?

2. NEED FOR PRIORITY AT EPA FOR DEVELOPMENT OF STANDARDIZED METHODS OF SAMPLING AND ANALYSIS

YOU STATE IN YOUR TESTIMONY THAT A PROGRAM OF DEVELOPMENT OF STANDARDIZED METHODS OF SAMPLING AND ANALYSIS NEEDS A HIGH POLICY PRIORITY AT EPA. EPA'S TESTIMONY LAST WEEK STATED THAT THE AGENCY SET UP IN FY'83 AN AIR TOXIC MONITORING CENTER IN PHILADELPHIA, AND THAT ONE OF ITS PURPOSES IS TO EVALUATE NEW SAMPLING AND ANALYSIS TECHNIQUES.

- ARE YOU AWARE OF THE MONITORING CENTER IN PHILADELPHIA?
- HAVE YOU SEEN ANY RESULTS OF THE CENTER?
- HAS THE CENTER YET DEVELOPED ANY STANDARDIZED METHODS OF SAMPLING AND ANALYSIS?

3. ROLES OF FEDERAL, STATE AND LOCAL GOVERNMENTS AND REGIONAL COMMISSIONS, IN A NATIONAL ENVIRONMENTAL MONITORING PROGRAM

IN YOUR TESTIMONY YOU STATE THAT INCREASED FEDERAL FINANCIAL AID IS NEEDED, THAT PUBLIC SECTOR SUPPORT IS NEEDED TO DEVELOP LESS EXPENSIVE AND MORE EFFICIENT INSTRUMENTS AND PROCEDURES, AND THAT TECHNICAL ASSISTANCE FROM EPA IS VERY IMPORTANT IN HELPING STATES IMPROVE EMISSION INVENTORIES.

- DO YOU CONSIDER THESE TO BE APPROPRIATE CONTRIBUTIONS FROM THE FEDERAL GOVERNMENT IN A NATIONAL ENVIRONMENTAL MONITORING PROGRAM?
- WHAT OTHER TYPES OF PARTICIPATION ARE APPROPRIATE FOR THE FEDERAL GOVERNMENT?
- WHAT SHOULD THE STATES, REGIONAL COMMISSIONS, AND LOCALITIES DO?

4. SELECTION OF TOXIC POLLUTANTS WHICH SHOULD BE MONITORED

EPA'S TESTIMONY OF LAST WEEK LISTS THE CRITERIA POLLUTANTS, BUT DOES NOT IDENTIFY ANY OF THE NON-CRITERIA POLLUTANTS. AND YOUR TESTIMONY STATES THAT IT IS EXTREMELY DIFFICULT TO SELECT THE TOXIC POLLUTANTS WHICH SHOULD BE MONITORED.

- WHAT ARE THE STEPS THAT WOULD HAVE TO BE TAKEN TO SELECT THE TOXIC POLLUTANTS WHICH SHOULD BE MONITORED?

STATE OF CALIFORNIA
GEORGE DEUKMEJIAN, Governor
AIR RESOURCES BOARD
1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812
(916) 322-2890

July 19, 1983

Mr. James Harrison
Subcommittee on Natural Resources,
Agriculture Research and Environment
Room 389, House Office Building, Annex #2
Washington, D.C. 20515

Dear Mr. Harrison:

This is in reply to a letter of June 13, 1983 by Congressman James H. Scheuer, Chairman, Subcommittee on Natural Resources, Agriculture Research and Environment, regarding national environmental monitoring programs. Congressman Scheuer asked that I send to you a corrected manuscript of my testimony presented at the Subcommittee meeting held on May 26, 1983. A copy of the corrected manuscript is enclosed.

He also asked that I respond to a list of questions enclosed with the letter.

Following are my responses, preceded by the questions which were listed.

1. IN YOUR OPINION, IS A ROUTINE, NATIONAL NON-CRITERIA POLLUTANT MONITORING PROGRAM NEEDED?

Yes - if administered with appropriate flexibility. Such an effort should differ substantially, however, from the existing monitoring program for criteria or conventional pollutants.

As noted in my testimony, most non-criteria pollutants are associated with discrete sources which are widely scattered. The mix of non-criteria pollutants in the ambient air will therefore vary widely from location to location. In this situation it would be wasteful and unnecessary to replicate the existing approach for conventional pollutants, i.e. routinely monitor a nationally selected set of pollutants on a uniform basis across the country. Instead, monitoring systems should be custom designed to measure only those pollutants that are actually emitted in each area. State and local air agencies are best suited to design such networks.

National consistency is needed, however, in the methods of sampling, chemical analysis and data analysis. Federal financial and technical support is essential to most state and local agencies. A national data storage system is a viable proposition if designed to provide useful and timely information to those state and local agencies which contribute data.

IF NEEDED, THEN PLEASE COMMENT ON EPA'S LACK OF PLANS TO ESTABLISH SUCH A PROGRAM.

The EPA is showing increased awareness of the need to improve the data base but is still moving very tentatively. It is our understanding that EPA intends to establish approximately 15 toxic pollutant trend monitoring sites nationally in order to establish some measure of the status and trend of toxicant concentrations. Additionally, the EPA is planning to develop quality assurance measures for monitoring toxicants. While welcome, these plans fall far short of the magnitude and urgency of the effort that is needed.

IF NOT NEEDED, THEN WHAT KIND OF A MONITORING PROGRAM DO WE NEED FOR NON-CRITERIA POLLUTANTS?

It is my belief that a selective approach to toxicant monitoring will be more effective than the uniform monitoring approach used to monitor criteria pollutants.

2. ARE YOU AWARE OF THE MONITORING CENTER IN PHILADELPHIA?

We recently became aware that some collaborative testing work is being carried out at Philadelphia to determine the comparability of various sampling and analysis techniques.

HAVE YOU SEEN ANY RESULTS OF THE CENTER?

No.

HAS THE CENTER YET DEVELOPED ANY STANDARDIZED METHODS OF SAMPLING AND ANALYSIS?

Not to my knowledge.

3. DO YOU CONSIDER THESE (FEDERAL FINANCIAL AID AND TECHNICAL ASSISTANCE FROM EPA) TO BE APPROPRIATE CONTRIBUTIONS FROM THE FEDERAL GOVERNMENT IN A NATIONAL ENVIRONMENTAL MONITORING PROGRAM?

Yes, the federal government should take a lead role in providing the financial resources necessary to characterize the nature and extent of exposure to airborne toxic substances across the country.

WHAT OTHER TYPES OF PARTICIPATION ARE APPROPRIATE FOR THE FEDERAL GOVERNMENT?

a) Develop monitoring instrumentation and analytical procedures including research to develop new less costly instruments and procedures.

b) In conjunction with the National Bureau of Standards, establish and maintain measurement reference materials for purchase by the state and local monitoring agencies as calibration standards.

c) Sponsor interlaboratory audits and measurement comparisons.

d) Serve as a clearinghouse for technical information.

e) Ultimately, promulgate regulations which specify measurement methods and quality assurance procedures when data are for regulatory use.

f) Store and distribute data to users in a timely fashion.

g) Provide direct financial support to assist state and local agencies purchasing equipment and operating monitoring networks.

h) Provide regional laboratory support to state and local agencies.

WHAT SHOULD THE STATES, REGIONAL COMMISSIONS, AND LOCALITIES DO?

a) Design monitoring networks to obtain ambient data.

b) Collect and analyze toxicant samples or, if analytical capabilities are not available, provide samples to EPA or an EPA contractor for analysis.

c) Analyze and interpret data.

d) Regulate and control emissions of toxics.

4. WHAT ARE THE STEPS THAT WOULD BE TAKEN TO SELECT THE TOXIC POLLUTANTS WHICH SHOULD BE MONITORED?

As indicated in our response to question 1, toxic pollutants are varied in nature and, therefore, do not lend themselves readily to generalizations. But it would appear that the following steps need to be taken before a decision can be made to initiate monitoring for a toxic pollutant.

a) Identify those toxic pollutants which by virtue of the amount manufactured, the manufacturing process, and type of usage would be expected to be present in the atmosphere in detectable quantities.

b) Determine whether there is a reasonable expectation that exposure to the ambient concentrations of the toxic pollutant by a population is such that the level of effort required for monitoring and subsequent regulatory control is justified. Sampling surveys may be appropriate to verify the existence of certain pollutants.

c) Establish a priority list of toxic pollutants to allow resources to be channeled to those presenting the greatest potential danger to the public.

d) Confirm there is instrumentation available that is capable of routinely detecting and providing accurate data at feasible costs on ambient concentrations of the toxic pollutants. If methods are not available, initiate efforts to develop adequate or more efficient methods.

I trust you will find these responses helpful. Please contact me if you have any questions or need clarification.

Sincerely,

William W Sylte

William W. Sylte
Chief Deputy Executive Officer

Enclosure

QUESTIONS FOR DR. JOHN W. FARRINGTON

1. NON-EXISTENCE OF AN OPERATIONAL NATIONAL PROGRAM FOR MONITORING CHEMICAL POLLUTION OF LIVING MARINE RESOURCES

ON PAGE 24 OF YOUR TESTIMONY YOU STATED THAT AN OPERATIONAL NATIONAL PROGRAM FOR MONITORING CHEMICAL POLLUTION OF LIVING MARINE RESOURCES IN COASTAL AREAS DOES NOT EXIST.

- IN YOUR OPINION, SHOULD AN OPERATIONAL NATIONAL PROGRAM EXIST? SHOULD IT BE A MUSSEL WATCH PROGRAM? WHAT ARE THE ALTERNATIVES?
- WHAT IS CALIFORNIA GETTING FROM ITS STATE MUSSEL WATCH OPERATIONAL MONITORING PROGRAM?

2. RELATIONSHIP TO A NATIONAL ENVIRONMENTAL MONITORING PROGRAM

IN YOUR TESTIMONY YOU GAVE SEVERAL REASONS FOR THE NON-EXISTENCE OF AN OPERATIONAL NATIONAL PROGRAM. THESE INCLUDED: UNCLEAR NATIONAL POLICY OBJECTIVES, NOT KNOWING HOW TO IMPLEMENT THE MONITORING, AND FUNDING DISAGREEMENTS BETWEEN AGENCIES.

- COULD THESE PROBLEMS BE BETTER SOLVED IN A MORE COORDINATED NATIONAL ENVIRONMENTAL MONITORING PROGRAM AS DESCRIBED IN THE OPENING STATEMENT FOR TODAY'S HEARING?
- IF SO, HOW?

3. OTHER ADVANTAGES OF A NATIONAL ENVIRONMENTAL MONITORING PROGRAM

ON PAGE 30 OF YOUR TESTIMONY YOU MENTIONED THAT IT IS YOUR IMPRESSION THAT "AUTHORITY FOR A PARTICULAR PROBLEM OFTEN SEEMS TO BE ASSIGNED TO ONE AGENCY, EXPERTISE TO DEAL WITH THE PROBLEM IS IN A SECOND AGENCY, AND THE FUNDS TO DO THE WORK ARE IN A THIRD AGENCY. THE END RESULT IS A SERIES OF INTERAGENCY TRANSFERS, PASS-THROUGH FUNDS, AND CONFUSION."

- IN YOUR OPINION, COULD THESE INEFFICIENCIES AND DIFFICULTIES BE LESSENED OR REMOVED IN A MORE COORDINATED NATIONAL ENVIRONMENTAL MONITORING PROGRAM?
- IF SO, HOW?

Reply of Dr. John W. Farrington

Answer to Question 1.

An operational program on a national basis should exist. However, the objectives of such a program should be consistent with policy for protecting marine environmental quality. The subcommittee members and their staff are among those best qualified to judge if the information from the U.S. Mussel Watch or any other monitoring program is of use since they represent part of the "user group" for such information.

The participants in the Mussel Watch program hope that the information is useful. If it is not or if the information or explanations could be improved, then it would be helpful to have your suggestions.

I recognize that this does not provide a complete answer to the question and in part represents a question in reply to a question. However, it seems to me that this is part of the problem outlined by the subcommittee in the opening statement and background statement for the hearings. Some potential user group comes forward and says we need some type of monitoring information. A group of scientists, engineers, or others then proceed with a prototype or even an operational monitoring program. Is it the best evaluation to then ask the second group if their efforts were effective? The lack of identifiable user groups other than research scientists is often given as a reason for not monitoring. The lack of identifiable user groups implies a lack of policy or policy implementation. This is addressed, in part, in the answers to questions 2 and 3.

I think that Mussel Watch data has proven useful in several cases as indicated in my testimony. I think the "user groups" include the following and they should be asked if the Mussel Watch data is useful.

- Environmental Protection Agency
- N.O.A.A.
- U.S. Army Corps of Engineers
- State Governments in Massachusetts and California and probably New York and Rhode Island as examples of usefulness to states
- Petroleum Industry, e.g. American Petroleum Institute
- Electric Utility Industry
- FDA
- CEQ
- National Wildlife Federation
- Natural Resources Defense Council
- U.N. Environment Program
- UNESCO - Intergovernmental Oceanographic Commission
- International Council for the Exploration of the Seas
- Harbor and Port Authorities

I indicated in my written testimony several recommendations which I will not repeat here. However, I will restate that Mussel Watch type data is only one of several strategies for measuring environmental quality parameters in coastal areas.

A national monitoring program in support of marine environmental quality should eventually combine several strategies such as:

1) Remote sensing from satellites and aircraft.
2) Moored arrays of instruments with relatively simple sensors for measurements at specific special locations such as large urban harbor areas or near mouths of large rivers.
3) Periodic monitoring surveys using underway towed sensor arrays and discrete water column, sediment and biota sampling.
4) Mussel Watch type programs.
5) Integration with FDA food surveillance measurements programs.
6) Effluent monitoring for chemicals of concern.

In 1, 2, 3 above, there are still several technology and research problems to be solved before a full-scale national program could evolve.

The answer to your question in regard to the California State Mussel Watch can best be made by the California State officials. However, their use appears to be in general as described in sections of my testimony in regard to the national data set.

The question posed (1) is a good question but limited in scope to chemical pollution. There are equal or graver concerns with respect to biological pollution such as viruses. For many years, there have been operational programs concerned with monitoring shellfish for hepatitis vectors and red tide toxins. I am not as knowledgeable in these aspects of marine environmental quality as many other scientists, federal and state agency officials. They should be consulted as to policy objectives, how well the monitoring meets these objectives and other details relevant to the committee's deliberations.

The question seems to be limited in scope to U.S. waters. However, there are important international, regional and global concerns with respect to monitoring for environmental quality of oceans and seas. These need to be addressed within the context of national policy and plans for operational programs. I have indicated concern about the preceding in my written testimony.

Answer to Questions 2 and 3.

A National Environmental Monitoring Program implies either a national agency in charge or a strong coordinating committee with a lead agency. Given the variety of requirements for monitoring on national, regional, state, and local scales, it seems to be a waste of effort to create or mandate a single agency as the monitoring agency. At the very least, this would imply a single congressional oversight committee which seems unlikely. The diversity of monitoring activities can be a positive aspect if the diversity is explicitly recognized and coordinated towards some common goals on a national scale as well as satisfying more parochial or more local issues.

Since national monitoring must either be managed or carried out by federal agencies reporting via the Executive Branch, there will not be effective monitoring unless there is a clear policy and top level management support for these activities. If environmental protection has a high priority then coordinated efforts have a reasonable chance of success. These efforts will require some time to become useful and require a longer term funding commitment. If a ten or twenty year high quality set of data are needed to provide an answer as to whether or not lead concentrations or acid rain are increasing or decreasing as a result of regulation action (or lack thereof) then the ten or twenty year program has to be adequately funded for ten or twenty years. Interruption or reduced funding on timescales of political reality such as four year, two year, or six year terms can compromise the effectiveness and utility of monitoring data. By this example I am not recommending carte blanche funding without periodic review of relevance to policy objectives or without regard for quality control. I am simply raising the obvious realities of environmental science alongside the obvious realities of politics.

In summary, my answer is that many of the difficulties with present environmental monitoring activities are due to: 1) the newness of the lengths of time, the spatial scales and spatial intensity of sampling which are apparently required to answer some urgent questions about environmental quality; 2) the apparent lack of commitment to several national environmental monitoring efforts at the top levels of several federal agencies in the past few years. These difficulties and inefficiencies can be reduced but not eliminated because of the complexity of nature and the complexities of the political process. Reorganizations and renewal of efforts are in progress in two of the federal agencies involved in monitoring, EPA and NOAA. It is too early to evaluate the effectiveness of these reorganized efforts. However, my impressions lead me towards the optimistic view that positive steps have been and will continue to be taken towards more effective coordinated environmental monitoring on a national scale as more definitive policies are formulated.

Hearing: May 26, 1983 - Environmental Monitoring; Sbcte. on
Natural Resources, Agriculture Research and Environment
of the H/Science and Tech. Cte. Witness: Charles N. Ehler

Question:

1. SYNTHESIS OF MARINE MONITORING DATA FROM NOAA AND OTHER AGENCIES

On the first page of your testimony you mentioned that you were placing new emphasis on the synthesis of existing marine monitoring data from NOAA and other agencies. You mentioned EPA, the U.S. Geological Survey, the Corps of Engineers, the Department of Agriculture, and numerous state agencies.

- o What problems in quality control, data compatability, and other areas have you encountered in trying to use data from so many agencies together?
- o How have you resolved these problems?

Answer:

Quality control and data compatibility are significant problems when synthesizing, analyzing, and interpreting the existing data bases that have been developed by various governmental agencies of the Federal and state levels. However, most of the problems encountered are generic, regardless of the type of information contained in a data base. Time and space scales and the density of data available are always a problem, especially when attempting to integrate several data bases to analyze a given problem. Some data problems simply are a function of state-of-the-art of our abilities to measure certain phenomenon. The Ocean Assessments Division of the Office of Oceanography and Marine Services, National Ocean Service, collects, compiles, and synthesizes many types of information--physical, chemical, biological, economic, demographic, and juridictional -- which related to the use and health of the Nation's coastal and ocean regions. The benefits gained in terms of identifying and better understanding the factors and relationships affecting the health and use of coastal and ocean resources far outweigh the costs associated with working with these data bases. A great deal of care and time is required to understand and assess each data base the Ocean Assessments Division uses. OAD carefully documents the quality of its data through its active support and participation in NOAA's quality assurance program.

Question:

2. RELATIONSHIP BETWEEN MONITORING AND ADJUSTMENTS TO REGULATION

On page three of your testimony you stated that NOAA's goals in marine environmental monitoring included assuring that the existing regulatory framework for marine environmental quality provided effective protection, and that monitoring guided the adjustment of the regulatory framework when necessary.

This tie between environmental monitoring and adjustments to regulation is an important characteristic of a dynamic national program.

- o Give examples of situations where your monitoring of the marine environment led to adjustments of the regulatory framework.
- o What is your procedure for accomplishing this close coordination of environmental monitoring and adjustments to regulation?

Answer:

Monitoring and related marine environmental research can affect regulatory action directly and/or serve to assess the effectiveness of existing regulations. For example, the regulatory framework for ocean dumping includes published criteria and regulations in considerable detail. Their continuing revison relies on monitoring findings.

More specifically, NOAA monitoring of conditions in the New York Bight identified the relationship of sewage sludge disposal with other sources of pollutants to the Bight and contributed to decisions by EPA to retain use of the 12-mile site as an interim measure pending development of suitable alternatives. Similar findings from monitoring programs have led to a more recent conclusion that use of the 106-mile site is more environmentally preferable if the ocean disposal of sludge is to continue. Work by NOAA's Outer Continental Shelf Environmental Assessment Program (OCSEAP) has resulted in strict standards incorporated into drilling regulations specified by the Department of the Interior, e.g., depth of water, seasonal limitations, and disposal of drilling muds. Current NOAA monitoring of a proposed dredged material site off Norfolk, Virginia, provides the data required for decisions by EPA and Corps of Engineers on the designation of the site and the conditions of its use.

Procedures for reflecting the results of monitoring in possible adjustment of regulations vary and include periodic joint analyses with other Federal agencies, special synthesis meetings and reports, and detailed reviews of existing regulations when they are revised.

Question:

3. QUALITY ASSURANCE PROGRAM FOR TOXIC CHEMICALS AND PATHOGENIC MICROORGANISMS

On page seven of your testimony you stated that NOAA has established a Qualtiy Assurance Program for measurements of toxic chemicals and pathogenic microorganisms, to be conducted jointly by four of the line offices of NOAA.

- Who are the participants?
- What are their roles?
- When do you expect the Quality Assurance Program to be fully operational?
- Is any agency outside of NOAA involved?
- Are there any other agencies that should be working with NOAA in this area?

Answer:

The NOAA Quality Assurance Program is supported by the National Ocean Service, National Marine Fisheries Service, Office of Oceans and Atmospheric Research, and National Environmental Satellite, Data and Information Service.

The participants and their roles are: (1) a Quality Assurance Steering Committee, composed of a senior staff member from each NOAA line office and chaired by a member of the Administrator's staff, (2) a Quality Assurance Coordinator, provided by the National Ocean Service, (3) a Technical Committee, composed of technical specialists from NOAA, other Federal agencies, academia and commercial laboratories, and (4) an Advisory Group of eminent non-NOAA marine scientists.

The Steering Committee, working with the Coordinator, develops the operational guidelines for the program and ensures communication throughout the NOAA system. The Coordinator works with the other participants to carry out the program and promote interagency and international involvement. The Technical Committee identifies specific needs and the technical approach for meeting them. The Advisory Group provides overall program review for future acitivities.

The program will be operational by the end of fiscal year 1984.

The NOAA program was presented to representatives of other Federal agencies at a recent meeting of the Quality Assurance Sub-Committee of the Interagency Committee for Ocean Pollution Research, Development and Monitoring (COPRDM). The Environmental Protection Agency and National Bureau of Standards will be represented on the Technical Committee. Representatives from these agencies and from the Food and Drug Administration will be sought for the Advisory Group. Close interaction is planned with quality assurance activities sponsored by the International Oceanographic Commission. Involvement by other agencies or groups will be welcomed.

Questions Submitted for the Record

Implementation of Recommendations of the 1980 CEQ Report on Environmental Data and Monitoring

Question: On page 26 of the 1980 CEQ Report on Environmental Data and Monitoring, it says that "CEQ will work with appropriate individual agencies to implement the recommendations by developing suitable implementation plans."

How many implementation plans have been developed?

When were they completed?

With what agencies?

Answer: At the present time, CEQ is working with EPA to completely review of all of EPA's monitoring activities. In addition, I have formally asked EPA to detail an environmental monitoring and data specialist to CEQ for a period of one year to assist CEQ in addressing this whole issue of environmental monitoring. Using our experience gained from the EPA review, it is my intention to initiate similar reviews within other agencies.

Support of Recommendations of the 1980 Report

Question: Your testimony focused on two of the major issues raised by the Report: Assuring the quality of environmental data, and coordination of environmental monitoring and data activities. A total of 13 specific recommendations were made in the Report.

Do you fully support all of the 13 specific recommendations made in the Report?

Please identify any of the recommendations that you do not support, and explain why.

Answer: The current Council on Environmental Quality is generally sympathetic with the thrust and overall goals of the recommended activities embodied in the 1980 report, and it is my intent to specifically raise these recommendations for consideration by other federal agencies.

Overall Improvements in Quality Assurance and Coordination

Question: In your testimony you mentioned improvements in the quality of EPA's air monitoring data, and you used the Aquatic Life Survey as an example of improved coordination between EPA and the Department of the Interior's Fish and Wildlife Service.

Can you state that there have been overall improvements in quality assurance and coordination throughout the Federal agencies since the 1980 CEQ Report was issued? Please give examples for each agency.

Can you provide any similar information on the states, localities, and regional commissions?

Answer: There can be no doubt that there has been considerable improvement in data quality assurance activities since the 1980 CEQ report. I have already mentioned the improvements in air quality data at EPA. EPA has also stepped up its quality assurance efforts regarding water quality data and in building quality assurance requirements into its various testing protocols for toxic substances and hazardous waste monitoring procedures. The Fish and Wildlife Service has been putting increased emphasis on data quality assurance and you will recall that in Charles N. Ehler's testimony, he discussed the recent establishment of an overall quality assurance policy and program for the National Oceanic and Atmospheric Administration.

In the case of States, Localities and Regional Commissions, I am not intimately familiar with all cases, but I know that many states such as Iowa, California, and the four states which are parties to the Delaware River Basin Commission incorporate quality assurance programs into their monitoring activities.

QUESTIONS FOR DR. RICHARD M. DOWD

1. EPA SHUT DOWN OF INHALABLE PARTICULATE NETWORK

IN YOUR TESTIMONY YOU STATED THAT EPA HAD GOTTEN A START IN MONITORING METALS IN THE AIR THROUGH ITS INHALABLE PARTICULATE NETWORK, BUT THAT EPA IS NOW CLOSING DOWN THE ENTIRE NETWORK BECAUSE OF BUDGET REASONS.

- IS CLOSING DOWN THE INHALABLE PARTICULATE NETWORK A REASONABLE ACTION FOR EPA?
- WHAT IS THE IMPACT OF CLOSING DOWN THE NETWORK?

2. INDUSTRY AND OTHER PARTICIPATION IN AMBIENT MONITORING OF TOXIC SUBSTANCES

IN YOUR TESTIMONY YOU RECOMMEND CREATING A FRAMEWORK IN WHICH OTHER INSTITUTIONS, PARTICULARLY INDUSTRIES BUT ALSO INCLUDING UNIVERSITIES AND OTHER GROUPS, COULD TAKE PART IN AMBIENT MONITORING OF TOXIC SUBSTANCES.

- IS IT YOUR OPINION THAT INDUSTRY AND OTHER GROUPS WOULD AGREE TO PARTICIPATE? WHY?
- PLEASE PROVIDE MORE DETAILS ON WHAT THIS FRAMEWORK MIGHT BE. HOW WOULD IT BE ORGANIZED AND MANAGED?

1. EPA shut down of Inhalable Particulate Network.

   - I do not believe that at this point that eliminating the inhalable particulate network is a good idea. I understand that the particulate monitors with a size selection of 15 microns as being phased out in favor of those with a limit of 10 microns. While that in itself is a sensible action (given possible Agency action), it is going to leave a considerable period of time when the number of stations measuring inhalable particulate, either 10 or 15, will be reduced to very few. In fact, the total number of stations operating either at the 10 or 15 micron level is about 50 stations or less. I do not think that is appropriate.

     The impact of closing down the network for the near term would be to reduce the validity of data that's available on metals in the ambient atmosphere. This is exactly at the time period when Congress is concerned about this kind of information. The result is going to be less information on which to make decisions. If, in fact, the state and local governments are able to take over the operation and the maintenance of these inhalable particulate networks, there is no reason to believe that, in the long term, one cannot have an adequate network if quality control is carefully maintained; however, one ought not to reduce data so substantially for several years while the state and local operation are being phased in. These instruments should be maintained during the period of time that the transition is going on.

2. Industry and other participation in ambient monitoring of toxic substances.

   - I do believe that industry and other groups would agree to participate. Industry, in particular, but also, other institutions such as universities and environmental organizations have an interest in assuring that the data available for the measurements, particularly of hazardous pollutants in air and water, are as good as possible. Industry is affected everyday by the uses of such information.

Environmental groups feel that such information helps to explain and determine the kind of changes that need to take place.

Many industries are already carrying out substantial monitoring activities, both in air and water, and by allowing them to increase their measurement capability just a little, one could have a truly national scope of monitoring for toxic pollutants both in air and water.

The framework for using other institutions would have to be one which clearly spelled out the responsibility of EPA to become the quality assurance monitor. No data should be allowed into a system that has not met certain quality control checks. This should apply to industry as well as to state and local government. If an industry agreed to set up a monitoring station meeting certain criteria of the Agency in terms of methods and quality control and site selection, then the industry ought to be able to introduce information into the Agency's monitoring system. The framework should then spell out the ability of the institution to be able, as a matter of right, to use other ambient monitoring information that the Agency has. There should be an opportunity for sharing of data both ways. An appropriate mechanism would be to start with a National Conference on environmental monitoring which would establish, for air and water, the kinds of pollutants that ought to be measured and under what circumstances. It would discuss the measurement methods in subcommittees that would serve very much in the way of ASTM committees, working with EPA. These committees would serve as working committees which would provide continuous advice to the Agency on its monitoring activities in an informal but effective way, because they were part of the monitoring program. The people who are on these committees would be part of industries that were actually carrying out monitoring providing data to the Agency and also having the opportunity to use the data that the Agency had stored. The Agency, in-turn, would monitor the quality of the instrumentation, the site selection, and the data that was submitted.

Such an effort could be initiated by a steering committee that consists of staff from EPA and from other federal agencies, such as USGS and NOAH, as well as from interested institutions, such as CMA or inidividual industries, universities, and environmental groups. The steering committee should plan a series of workshops which would help define whether and how other institutions would take part in a nationwide planning strategy. Such a group in conjunction with a congressionally mandated commission, if such is set up, could help determine the level of resources that are necessary to fund a truly adequate national monitoring program.

QUESTIONS FOR MR. JAMES E. NORRIS

1. *Ground water monotoring.*—On pages 7 and 8 of your testimony you point out that little resources are devoted to establishing an actual monitoring program on identifying health and environmental effects related to ground water contamination, and we still have no real idea of the extent of contamination in the ground water of this country.

Would identifying health and environmental effects related to ground water contamination be an appropriate goal of a National Environmental Monitoring Program?

Would obtaining information on the extent of ground water contamination be an appropriate goal of a National Program?

"Would identifying health and environmental effects related to ground water contamination be an appropriate goal of a National Environmental Monitoring Program?"

CMA believes such a goal is appropriate to realistically identify the magnitude of ground water contamination. Tools now exist which can identify and quantify many contaminants. Information on health and environmental effects is needed to assess the significance of identified contaminants.

"Would obtaining information on the extent of groundwater contamination be an appropriate goal of a national program?"

Again, CMA supports such a goal. This action would be consistent with providing additional funding to EPA's Office of Research and Development for "anticipatory" monitoring concepts.

QUESTIONS FOR DR. CLARENCE DAVIES

1. *Bureau of Environmental Statistics.*—In your testimony you stated that we needed a new organization called the Bureau of Environmental Statistics, with a function for environmental data similar to the Bureau of Labor Statistics for economic data.

Please provide more details on what this Bureau would do.

How would this Bureau of Environmental Statistics compare to and relate to OMB's Statistical Policy Division, and CEQ?

2. *National Ecological Research Center.*—In your testimony you stated that we needed a new organization called a National Ecological Research Center, to conduct and have central responsibility for basic ecological research. You stated that the Conservation Foundation is in the middle of conducting the analyses needed to make such a proposal substantively and politically viable.

Please provide more details on what this Center would do.

Are any of the envisioned activities of the Center now being conducted by any government agencies? If so, which activities and which agencies?

What are the results obtained so far from The Conservation Foundation's analyses?

3. *Monitoring of toxic substances.*—In your testimony you stated that monitoring of toxic substances was an example of science not being able to tell us what we should be monitoring, and technology not being available to allow us to monitor.

What do we need to do so that science will tell us what to monitor, and so that technology will allow us to do the monitoring?

Are there any additional steps we could take to improve our monitoring of toxic substances?

RESPONSES OF J. CLARENCE DAVIES

1. *Bureau of Environmental Statistics.*—The proposed bureau would have several functions. These would include:

(1) It would be a clearinghouse and central source of information for environmental data in both published and computerized form. It would keep an up-to-date record lf all environmental data bases and monitoring studies, governmentals and non-governmental, that could be of use to policy makers.

(2) It would coordinate the work of federal agencies in collecting environmental statistics. This function would be performed in a variety of ways: the bureau would develop standards for data collection, processing, analysis, and reporting; it would provide input to OMB and Congress on budgets for environmental data collection; it would work with other agencies to reduce duplication and encourage sharing of data.

(3) It would publish documents summarizing and analyzing environmental data. These would include regular publication of a set of environmental indicators and

periodic publication of a handbook of environmental statistics. The bureau might occassionally sponsor special studies but it would not itself do any actual monitoring.

(4) It would work with the principal international organizations involved with environmental data (UN, OECD, EED, etc.) to improve the quality and coordination of global monitoring data and to permit, through common efforts and reciprocal agreements, U.S. access to relevant environmental data from other countries.

(5) It would work with industry, universities, and research institutes to get access to data from non-governmental sources and would develop cooperative arrangements with the private sector to speed access to information.

In a sense, the bureau would combine many of the environmental data functions of CEQ and OMB's Statistical Policy Division. CEQ has been so weakened that it is no longer able to carry out most of its functions. OMB has not paid much attention to coordinating environmental data, and it is not authorized or prepared to perform the dissemination and outreach functions described above.

2. *National Ecological Research Center.*—The impetus for considering creation of a National Ecological Research Center was our perception that ecological research is scattered among a large number of federal agencies, that no agency has any overview or coordination responsibility for such research, that it is frequently done by small groups working in isolation both from the rest of the agency in which it is located and from others engaged in such research, and that the results of the research often fail to reach those who can best use it.

Our current thinking is that the Center would be a semiautonomous federal institution (perhaps modeled on the National Center for Atmospheric Research) which would conduct basic ecological research. It would be formed by transferring people and dollars from existing agencies.

The Conservation Foundation has done a preliminary survey of what ecological research is now being done in the federal government. Our next step is to put this information in more organized form and make some tentative judgments about which programs could logically be transferred to the proposed center. At the same time, we are consulting with a number of knowledgeable individuals about whether our perceptions are correct and whether a center is really needed, and, if so, what form it should take.

We would be pleased to keep the committee informed about the progress of this work and would be glad to share with you any of the information we have.

3. *Monitoring of toxic substances.*—I suspect that there will not be a major improvement in monitoring toxics until there is more regulation of toxic substances. This is the reverse of what should happen in a logical world, but in our not-so-logical world there is currently an incentive for both government and industry not to monitor toxics lest the monitoring reveal difficult problems calling for additional regulation. It should be possible to structure whatever regulatory actions are taken so that they encourage additional monitoring.